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AIPSLETTER

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National Radio Astronomy Observatory

A newsletter for users of the
*A*stronomical *I*mage *P*rocessing *S*ystem

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TEXset by EWG

AIPS Group Expands

We are pleased to announce the arrival of Chris Flatters and Bill Junor as new members of the NRAO *AIPS* group. They will work in Socorro, in close liaison with the group in Charlottesville. By being in Socorro, they will be able to assist VLA users, to observe the functioning (or failing) of the *AIPS* code in the VLA environment, and to interact closely with the resident NRAO scientists and visitors. We hope that establishing this strong *AIPS* "presence" in New Mexico will enhance the relationship between the *AIPS* group and all VLA users.

Chris comes to us from Jodrell Bank, with experience of writing the polarization reduction software for MERLIN and of *AIPS* management in the Convex C-1 at MPIfR in Bonn. Bill has been managing *AIPS* at Bologna, and before that was also working with MERLIN at Jodrell Bank.

We expect that there will be additional positions for scientific programmers in the Charlottesville *AIPS* group opening up within the next year. These may be specifically in support of the VLBA or, possibly, more general NRAO positions. If you might be interested in such positions when they arise, please contact Bob Burns in Charlottesville [(804) 296-0229] so that we can ensure that you receive an announcement of any that might be appropriate for you.

The *AIPS* Code Overhaul

On Friday, the 13th of January, we began the debugging of the overhauled *AIPS* code. We started that debugging on the SUN, the only system for which we had completed the initial overhaul of both Z and Y routines. We are extremely pleased to report that the new code came up very quickly and, by this writing, the **DDT** set of programs plus many of the calibration and other tasks are already working. Apparently, the rate of bugs due to, or exposed by, the overhaul is substantially less than we had expected. Most of the *AIPS* code has been through the overhaul process, but the Z and Y routines for other systems (*e.g.*, Convex and VMS, IIS and DeAnza), and some less used, or extremely non-standard, programs, remain to be done.

1988 *AIPS* Site Survey

The forms for the 1988 *AIPS* Site Survey were mailed in December and over half have now been returned by the site managers. If you are an *AIPS* Contact Person and have not yet responded to the Survey for your site, please do so as soon as possible. The new Site Directory and statistical summaries will be compiled early in March and should be available as *AIPS* memos with the **15APR89** release.

The 15JAN89 Release

In the 15-July-1988 *AIPSLETTER*, we described the "code overhaul" which we began in April. Until this "new" *AIPS* is completed and tested, all releases will exist at NRAO as "new" versions only and code development in them will be restricted to submitted tasks and the correction of significant errors. The **15JAN89** release is very similar to the **15OCT88** release, with the correction of a few bugs. The last release of the "old" (pre-overhaul) *AIPS* will be the **15APR89** version, and the overhauled version will be ready for a **15JUL89** release.

There are only 42 changes listed in the following reproduction of **CHANGE.DOC**. This new low is due to the code overhaul. Four tasks had new options added. These are **UVCOP** which can now restrict the **ANTENNAS** and **BASELINES** (# 4885), **SPLIT** which can now average more complicated sets of channels (# 4899), **GREYS** which can now plot the locations of boxes and slices (# 4890), and **PLCUB** which can now Hanning smooth the spectra before plotting (# 4915). A serious bug, affecting data selection by **MX** for polarized images, was discovered and corrected (# 4881). Several persistent bugs were finally tracked down and squelched in **FILLM** (#s 4889, 4893, 4902, 4905, and 4912). Bandpass calibration, including the handling of large tables, was improved (#s 4898, 4892, 4894, 4896, 4897) and **CLCOR** now has a better atmospheric model and other improvements (#s 4895, 4900). **VTESS** now handles default images correctly and has a correct **INPUTS** and **HELP** file (#s 4913, 4916).

A preview of the code overhaul has been provided for programmers. The translation programs **XLATE** and **XEDIT** together with some useful procedures and the input files for **XEDIT** are provided with this release (#s 4910, 4918–4920). These files are provided for educational, not production, use at this time.

15-January-1989 Statistics

From the **EXPFIT** program come the following statistics for selected releases:

Release	15APR86	15OCT86	15APR87	15OCT87	15APR88	15JAN89
Directories	51	74	79	85	91	89
Text files	2,788	3,188	3,448	3,577	3,866	3,858
Text lines	457,373	512,935	607,108	619,800	680,088	697,733
Compressed bytes	15,051,843	16,839,059	19,899,828	20,229,072	22,203,970	22,734,708

From the **WHOGETS.ADR** file come the following statistics:

Contact persons	147	174	197	210	245
AIPSLETTER recipients	720	759	339	368	439

Two unimportant directories (**YPGVMS** and **YNOT**) were omitted to force the files to fit on one unblocked, 1600-bpi tape.

FITS-Disk Agreement

An increasing number of astronomers are using observations in several wavelength regions (*e.g.*, optical, infra-red, and radio) in their research. In general, different data reduction software packages are used for the different wavelength regions. Also, different software packages have different capabilities, strengths, and weaknesses. It is, therefore, important to ease the transfer of data between image processing systems. As a first step in this direction, *AIPS* and *MIDAS* have agreed to write FITS files on disk with identical specifications. This will enable users of these systems to exchange data files much faster via disk instead of passing through a magnetic tape. *AIPS* already conforms to the agreement, while *MIDAS* will implement it as of the 89MAY release.

The agreement specifies that FITS disk files have a record size of 2880 bytes, which is the standard FITS logical record length. There shall be no "extra" bytes in a record, such as those used to specify variable lengths on some systems. In this way, FITS disk files may be passed between different operating systems through networks with no ambiguity. The use of a 2880-byte record implies that reading programs are not required to reblock the data into logical records, although packages such as *AIPS* and *MIDAS* can be expected to have that capability in future.

Editors' note: The two paragraphs above are the text of the joint agreement to be published here and in the *ESO Messenger*. It turns out that the agreement is hardly necessary for UNIX systems since UNIX files are byte streams with no real concept of record length. However, on VMS there is strong file typing and record-length control. The routines `ZTPOPD` and `ZTPMID` specify that the file be *direct access* and *unformatted* with a `RECL` of 2880 bytes. This appeared to be the only way under VMS to get a Fortran file with no extra bytes in it. *AIPS* provides a VMS procedure called `SYSVMS:FIXFITS.COM` to convert files with other record lengths (*e.g.*, 512-byte files produced by `FTP`) into the expected length (see change # 4921 below). In some future release, we expect to improve our FITS-disk reader so that it can handle files which do not meet the agreement. Our FITS-disk writer will always produce only 2880-byte records.

AIPS Publications

The Order Form at the end of this *AIPSLETTER* may be used to order the following memoranda and books. All previous memoranda are also available.

AIPS Memo No. 58: "*AIPS* Benchmarks on the CLSC and PSC Cray X-MPs," Kerry C. Hilldrup, November 1988.

> *AIPS* has been ported to two Cray X-MP systems under the COS operating system, and `DDT` ("Dirty Dozen Test") benchmarks have been run on both systems, one in stand-alone mode. Comparisons between the `DDT` timings from the two X-MPs as well as the NRAO-CV Convex C1 have been tabulated. On some `DDT` problems, the CPU times suggest that the two X-MP systems are very nearly equal. However, for most of the `DDT` problems, the CPU times differ substantially. On the Pittsburgh Supercomputer Center system, which uses a heavily modified version of Cray's permanent dataset management, the CPU times can be greater by a factor of 10 or more (depending on the size and verbosity of the problem). The best real time performance on the X-MPs is better than the C1 by about a factor of 8, but more typically only by a factor of 2–3. The real times at Pittsburgh were degraded by other users, but, even taking that into account, were not significantly better than those of a C1.

Editors' note: Since these results are disappointing and since Cray appears to be phasing out its COS operating system, we do not intend to support or develop the COS version further.

4890. *December 16, 1988* GREYS *Neil Killeen/Eric*

Revised **DGRY.INC, CGRY.INC, GREYS.HLP,** and **GREYS.FOR** to add options to plot lines showing location of windows (adverb **BOXES**) and slices (from **SL** files). Also reordered the grey-scale and labeling plot commands so that the latter will not be overlaid and lost on postscript plotters. Corrected bug in star plotting following labeling with **LTYPE > 3.**

Moved nowhere yet, Phil to move to **15JUL89.**

4891. *December 19, 1988* DSEL, CSEL, UVGET, NXTFLG *Phil*

NXTFLG was not flagging multiple channel/IF combinations because it was using the catalog pointers relevant to the output file on the input file and so did not know how many channels or IF's were in the data. Added two pointers for these to **DSEL.INC** and **CSEL.INC** and changed **UVGET** and **NXTFLG** to use these pointers. All relevant routines recompiled and relinked.

Moved to **15JUL89.**

4892. *December 20, 1988* BPASET, BPSRT, IBPSRT *Phil*

Due to an **I*2** problem, the table-sorting routines were not able to cope with the large spectral line data bases now available from the VLA. So, modified **BPASET** to define the buffer sizes with an **I*4** variable, and created temporary copies of **TABSRT** as **BPSRT** and **ITBSRT** as **IBPSRT,** which also carry the buffer size as an **I*4.** This problem will go away with the new *AIPS*, so **BPSRT** and **ITBSRT** will not need to exist for long.

BPASET moved to **15JUL89** this date.

4893. *December 21, 1988* FILLM *Phil*

The time of the **CL** table was incorrect if the observations passed through midnight; added **DAYOFF** to the times in subroutine **FLMCAL.**

Moved to **15JUL89** this date (more or less).

4894. *December 22, 1988* BPASET, DATBND *Phil*

These routines were unable to cope with dual polarization line data due to indexing problems; these were fixed.

Moved to **15JUL89** this date.

4895. *December 22, 1988* CLCOR, ATMFAZ *Bill*

Added new, improved model for the atmospheric delay and rate using the CfA-2.2 mapping function. The model computations are done in **ATMFAZ.** Also changed **CLCOR.HLP.**

Moved to **15JUL89** this date (more or less).

4896. *December 23, 1988* BPGET, DECIND *Phil*

BPGET was falling flat on its face when trying to do the bandpass corrections for large spectral line databases due to more indexing problems. It will have worked for experiments with fewer than 128 channels times 14 antennas, or some combination thereof. Fixed the problems and also removed subroutine **DECIND,** which is no longer needed after the fix.

Moved to **15JUL89** this date.

4897. *December 30, 1988* FITTP *Phil*

The buffer size for **TABINI** was too small for the large **BP** tables; changed from 512 to 4096.

Moved to **15JUL89** this date.

4898. *January 2, 1989* BPASS *Phil*

Numerous changes were made to cope with the large number of channels and dual polarization data now available from the VLA. The most important were: (a) all the indexing for dual polarization data was sorted out; (b) in the course of doing (a), I decided to remove the option to average two polarizations together; (c) **BPSOL** (which runs the main band calculation routine) was modified to prevent it from doing two polarizations in one run [(b) and (c) simplify the code tremendously]; (d) the **BP** table buffer sizes were sorted out; (e) a minor buffer declaration error was corrected in **BPDIV. BPASS.HLP, DBPS.INC,** and **CBPS.INC** were also slightly modified.

Moved to **15JUL89** about this date.

4899. *January 2, 1989* SPLIT *Phil*

Added the **BPARM** array to **SPLIT** and **SPLIT.HLP** so that channel selection can now be specified in a slightly more general way when averaging in frequency. The **BPARMs** are used as an array of 5 start and stop channel numbers to be averaged. Also changed **D/CSPT.INC.**

Moved to **15JUL89** about this date.

4900. *January 2, 1989* — CLCOR — *Phil*

Modified the **PHAS** option slightly so that phase offsets that vary linearly with time can now be removed. Also updated **CLCOR.HLP** to reflect this change.
Moved to **15JUL89** about this date.

4901. *January 5-9, 1989* — Miscellaneous — *Eric*

Added lots of text to **SYSSUN:SSS.TXT** to put all of the explanations of the SUN Screen Server together. Corrected **INSVMS:ICREOPT.COM** to add another pass through link directories for **QYPGNOT:** to account for changes made by Cornwell. Corrected a declaration in **APLSUN:ZSSSO2.C**.
Moved to **15JUL89** as well.

4902. *January 16, 1989* — FILLM — *Bill/Phil*

When a logical record spanned two physical tape records, an offset was introduced into the visibility indexing, causing the part of the spectrum on the second physical record to be incorrect (the imaginary part of one channel was taken with the real part of the next). This bug only affected spectra which spanned the physical record, all other spectra were okay. Also, the compression of the *uv* disk file was not working properly; fixed that. The **NX** table entries were sometimes, and for some unknown reason, being written for every time stamp. Recompiling made this go away! Also changed **D/CMC2.INC**.
Moved to **15JUL89** about this date.

4903. *January 16, 1989* — VLBIN — *Phil*

Fixed trivial little bug in an **ENCODE** statement.
Moved to **15JUL89** this date.

4904. *January 16, 1989* — CALIBRAT.HLP — *Phil*

Added sections on calibration of spectral line VLA data and general bandpass calibration.
Moved to **15JUL89** this date.

4905. *January 18, 1989* — FILLM — *Phil*

FILLM refused to average data after midnight; this was due to problems with the **DAYOFF** variable. Fixed this, but also ensured that **FILLM** did not average across the midnight boundary.
Moved to **15JUL89** this date.

4906. *January 19, 1989* — ZDELA2 — *Dave Shone/Kerry*

Added "optional" third argument in call to **setitimer** as a dummy argument in **APL4PT2:ZDELA2.C**. Otherwise, this version of **ZDELA2** would not work on Alliant systems. This makes the special **APLALLN:** version of **ZDELA2** unnecessary, and it has, therefore, been deleted.
Moved to **15JUL89** same date.

4907. *January 19, 1989* — ZTKCL2 in APLBERK — *Chris Flatters/Kerry*

Changed an assignment statement to eliminate an obsolete C construct (*i.e.*, changed **tek.sg_flags &= ~RAW;** to **tek.sg_flags = tek.sg_flags & ~RAW;**) which may have been the reason behind hung Tektronix devices on many systems. For example, this minor change cured a hung Tektronix device problem on one of two nearly identical SUN 3/60s.
Changed by Eric in **15JUL89** on December 16, 1988.

4908. *January 19, 1989* — ZCREA2 in APL4PT2 — *Kerry*

Implemented **statfs** (4.3 bsd UNIX?) to extract available space information for the target file system prior to attempting file creations. Formerly, insufficient space was only detected when all space had been consumed. It may be possible to implement a similar mechanism via **ustat** for purely System V environments.
Moved to **15JUL89** same date.

4909. *January 19, 1989* — ZTKFI2 — *Kerry*

Changed **APLUNIX:ZTKFI2.C** to allow a TK read to be more bytes than the 5 requested for cursor reads. Some systems return extra bytes.
Moved to **15JUL89** as well.

4910. *January 24, 1989* — XEDIT1.STR, XEDIT2.STR — *Bill*

Put the standard list of **XEDIT** commands in **SYSAIPS:XEDIT1.STR** and **XEDIT2.STR**. They should be copied to **XEDIT.STR** in the directory in which the conversions are to be done.
Moved to **15JUL89** same date.

4911. *January 24, 1989* AREAS.DAT *Eric*

Combined the VMS and UNIX versions of **AREAS.DAT** — mostly using the UNIX version. Created new areas **SYSAIPS**, **LOAD4**, and **LOAD5**. This file will be used for both systems beginning in **15JUL89** and later releases.
Moved to **15JUL89** with system procedure changes as well.

4912. *January 25, 1989* FILLM *Phil*

Found and fixed the indexing bug which was causing spectra which crossed a tape physical record boundary to be in error. (Oh, the pain that simple sentence summarises!) Also changed **D/CMC2.INC**.
Moved to **15JUL89** same date.

4913. *January 25, 1989* VTESS *Eric*

When a default image was requested, the header for the output image was being overridden. Saved and restored it.
Moved to **15JUL89** by Bill this date.

4914. *January 26, 1989* VLA has moved *Eric*

Changed the network address of **CVAX** in the **UPDVLA:CONFIG.COM** file to allow the midnight job to resume execution.
Moved to **15JUL89** this date.

4915. *January 26, 1989* PLCUB *Neil Killeen/Phil*

Added the option to Hanning smooth rows.
Moved to **15JUL89** same date.

4916. *January 26, 1989* UTESS, VTESS *Shoshana Rosenthal/Kerry*

Changed **OUT2CLASS** to **OUT2CLAS** everywhere in the help files.
Moved to **15JUL89** same date.

4917. *January 26, 1989* ZTACT2 in APL4PT2 *Kerry*

Added a test for **errno == EPERM** (*i.e.*, not owner) from **kill (0, pid)** to indicate that the **pid** is active. Otherwise, active **pid**'s not owned by the caller were mistakenly deemed inactive and erroneously permitted multiple, simultaneous executions of the same program under the same *POPS* number (*e.g.*, two **AIPS1**s).
Changed in **15JUL89** same date.

4918. *January 27, 1989* XLATE in AIPPGM and AIPGVMS *Kerry*

Changed string search for **ENCODE** to **DECODE** (already changed in **AIPPGM** version). Corrected erroneous conversion of **ALOG10** and **DLOG10** to **LOG** (converted to **LOG10** now). This is a new file in **15JAN89**.
Changed in **15JUL89** same date.

4919. *January 27, 1989* XLATE, XEDIT start-up scripts *Kerry*

Created start-up scripts in **SYSUNIX** for the execution of the **XLATE** and **XEDIT** source-code overhaul service programs.
Changed in **15JUL89** same date.

4920. *January 27, 1989* XEDIT *Bill*

A procedure to execute **XEDIT** is present in **SYSVMS:** and the code is in **AIPGVMS:**. The code will not be easy to compile since it requires pre-processing and use of **INTEGER** as four-byte integers. It is included for completeness and forewarning.
Moved from **15JUL89** this date.

4921. *January 28, 1989* FIXFITS.COM *Chris Flatters/Eric*

Changed **SYSVMS:** procedure which makes FITS disk files into the required VMS format. Disk-based FITS files that have been transferred from other systems using **ftp** are usually written using fixed-length records of 512 bytes under VMS. The DCL procedure **FIXFITS** in **SYSVMS** fails to convert these to the required 2880-byte records, complaining that the original records are too short. The revised version of **FIXFITS** uses **COPY /OVERLAY** rather than **CONVERT /APPEND**.
Moved to **15JUL89** this date.

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   (*N.B.*: If you have received a plastic mailing container from us, we insist that you use it for a reorder. Also return tape(s).)

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   Version of UNIX system in use: _____
   N.B. we need to know this. *e.g.*, bsd4.*x*, Sys III, Sys V, V7, *etc.*
   (*AIPS*, neither UNIX nor VMS) . . . . ☐ FITS compressed text format
   (`DDT` test package: ≥ `15OCT87`) . . . . . ☐ `RUN` files, FITS binary data

5. Tape density desired: . . . . . ☐ 800 bpi ☐ 1600 bpi ☐ 6250 bpi

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A newsletter for users of the
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TEXset by EWG

A New *AIPS* Position

The NRAO has an immediate opening for a staff scientist (scientific programmer) in the *AIPS* Group. Responsibilities include the development and maintenance of applications code for the reduction of radio interferometric data in the *AIPS* system. This system is currently in use at NRAO on Convex C-1s, VAX 11/780s with array processors, and Sun workstations. Current computing plans call for installation of a second-generation mini-supercomputer networked to advanced imaging workstations.

Candidates should have experience with radio astronomical data processing or with *AIPS* (preferably both). An advanced degree in radio astronomy is desirable. A working knowledge of FORTRAN is essential, as is significant experience with either VMS or UNIX. Preference will be given to candidates with experience in advanced workstation imaging and/or graphics.

If the successful candidate has an active research program in radio astronomy or astronomical image processing, he/she will be encouraged to devote up to 25% of his/her time in self-directed research. Research that relates to the VLA or VLBI will be particularly encouraged. This is not a tenure-track position and is not subject to the NRAO tenure "clock." Advancement to the rank of Associate Scientist or Scientist can be made on the basis of merit and professional development at any time. If the successful candidate does not wish to pursue an ongoing research program, an appointment could be made as a Scientific Programming Analyst.

The successful candidate will be based at the NRAO Central Office on the grounds of the University of Virginia in Charlottesville, Virginia. This facility has a staff of 28 PhD astronomers, engineers, and computer professionals with responsibility to all NRAO observing sites.

The NRAO is an Equal Opportunity/Affirmative Action employer with an excellent fringe benefit program, including medical, dental and long-term disability insurance, and a fully vested retirement plan.

Candidates for this position should apply immediately to Dr. W. R. Burns at the NRAO in Charlottesville.

Summary of Changes: 15 January 1989 — 15 April 1989

With this issue of the *AIPSLETTER*, we are attempting to get back to normal in our handling of *AIPS* quarterly updates. The **15APR89** release of *AIPS* is the last "pre-overhaul" release. As such, it received only modest attention, with the addition of two tasks and the correction of several errors. Almost all of the programming attention was directed at the **15JUL89**, "overhauled" version of *AIPS* (see below). During the past quarter, **15JUL89** has received extensive debugging beginning on the Suns, then the Convex, and most recently the VAX. The details of this overhaul are summarized below, but have been omitted from the **CHANGE.DOC** file to save space and programmer effort. Additions to the code made in the **15JUL89** release — and there are several important new tasks and capabilities — are listed below in the **CHANGE.DOC** file. To save space and to improve the readability of the *AIPSLETTER*, we will now list a change only with the earliest release containing it (with notations about moving from **NEW** to **TST** as appropriate). although the programmers are still expected to make entries in *all* appropriate **CHANGE.DOC** files.

Changes of Interest to Users: 15APR89

The new tasks in **15APR89** are **ADDIF**, a simple task to add an **IF** axis to an image header (# 4947) and **CANPL**, a task to display *AIPS* plot files on Canon laser printers that was developed by the Starlink project (# 4924). A bug in **UVCOP** which required the specification of **ANTENNAS** and **BASELINE** was removed (# 4922). Bugs in **FILLM** related to averaging through midnight and concatenating data from two tapes were corrected (# 4927, 4946). **BPASS** was changed to handle spectra with more than 128 channels (#4929), **LISTR** was changed to do proper vector averaging of phases while doing scalar averages of amplitudes (# 4930), and **UVIMG** was changed to ignore flagged data under all circumstances.

Changes of Interest to Users: 15JUL89

Many changes to **15JUL89** are not listed in **CHANGE.DOC** below and users are cautioned "to watch the fine print" (*i.e.*, to read the **INPUTS** and **HELPs** carefully) in the new version for minor changes. The most serious change in **15JUL89** to the user is the change in the formats of all files. Data can be moved from earlier releases to **15JUL89** *only* by FITS tapes (or pseudo-tape disk files). We determined that a format translation program was too expensive to develop, so none is available.

Some old tasks whose functions were judged to be obsolete or replaced fully by other tasks were deleted. These include **NEWTB**, **PRTDR**, **STRIP**, **UVERR**, **VBCOR**, **IBMTP**, **CNVRT**, **EXPND**, **VM**, **EXFND**, **UVEXP**, **MPORT**, **XPORT**, **BCAL1**, **BCAL2**, **VBANT**, **LWPLF**, **QWKPL**, and **EXIND**.

The adverb **INTYPE** is no longer needed by many tasks and verbs that used to reference it. During the overhaul, it was removed from some of these, including tasks **TXPL** and **RGBMP** and verbs **QHEADER**, **IMHEADER**, **RENUMBER**, **CELGAL**, **ALTSWTCH**, **RENAME**, **RESCALE**, **CLRSTAT**, **AXDEFINE**, **ALTDEF**, and the **TK...** ones. Other changes of interest include the addition of options to **WTMOD** (antenna weights), **PUTVALUE** (omit history file), **PFPL3** (labeling type), and **FITTP** (32-bit floating output). **XTRAN** and **STARS** had the input file name changed to **INFILE**. **HGEOM** had the output size limit raised to 4096 and **AVTP** had the limit on the number of files raised. The default Stokes parameter in **TVFLG** was clarified and the default output flag file version was changed in **UVFLG**. Unused parameters were dropped from **NNLSQ** and no-longer available parameters were dropped from **GETHEAD** and **PUTHEAD**. Both of these also support the new "keyword=value" extension to the image headers. The special character backslash ("\") was changed to an underscore ("_") in verbs **BAMODIFY**, **MODIFY**, and **GRIPE** and in the wild-card scheme for **OUTCLASS**.

The changes that we actually list in **CHANGE.DOC** below are more exciting as they represent important new capabilities in *AIPS*. **HORUS** (# 4984) is a new task that makes images ***without needing to split*** the data out from the multi-source calibration file and ***without needing to sort*** the data. The first capability simplifies

self-calibration, and the second saves a factor of two in disk space. **HORUS** makes images in the style of **UVMAP**, up to a maximum that is limited only by the apparent size of the "array processor" — which was raised for machines which do vector operations in virtual memory (# 4982). Disk memory can never be handled by virtual methods, so a data compression was developed *to save a factor of two to three in disk space* for *uv* files (#4983). Many *AIPS* tasks can handle the compressed data. The others recognize that they cannot and so terminate politely. A new task, **UVCMP**, converts beween compressed and uncompressed *uv* formats. To aid in the calibration of VLA data, several procedures were made available in a **RUN** file (# 4998). The new task **SNPLT** plots the gains, delays, fringe rates, or system temperatures from **SN** and **CL** tables, either one antenna per plot or all antennas on a single, scatter plot (# 4981, 5008). **UVPLT** acquired the ability to read multi-source files and to apply any calibrations (# 5001) so that it may be used to guide editing during calibration. Data may now be appropriately reweighted when they are concatenated with **DBCON** (# 4988). Such reweighting is desirable under many circumstances, but is essential when combining data sets whose weights have been normalized using different conventions (*e.g.*, when combining VLA data sets calibrated in the DEC-10 with others calibrated using the *AIPS* VLB-style weight option). Spectral-line calibration was also improved with a "divide by channel 0" option in **BPASS** (# 4986) and with improvements to the averaging algorithms in **POSSM** (# 4990). Solar observations now have some chance of reasonable calibration with special options added to **FILLM** (# 4987). New tasks **TASAV** (# 4985, save a table file) and **SWPOL** (#4989, switch polarization) offer useful new services. The handling of classes and polarization in **VTESS** and friends has been cleaned up as well (# 4943, 4996).

The most visible change in the overhaul is that all informative messages from *AIPS* are now in upper-lowercase; error messages remain in uppercase only. A more subtle change is that *AIPS* 'blocks" of disk have changed from 512 bytes to 1024 bytes on most computers. Thus, **FREESPAC** will report only half as many disk blocks as before, but *the data files also require only half as much disk* when measured in blocks.

Changes of Interest to Programmers: 15APR89

The only noteworthy change is the improvements to the **DDT** test package reported in # 4938. Minor problems with the tests were cleaned up and a new, high-dynamic-range data set replaced the old "large" problem.

Changes of Interest to Programmers: 15JUL89

The overhaul is the largest "change of interest to programmers" in a long time (# 4957)! See the following article for the details not reported in **CHANGE.DOC**. The subroutines added to the system are listed in **CHANGE.DOC** below and reflect some of the structural improvements in *AIPS*. These include **H2CHR** and **CHR2H** (# 4960) for converting between **CHARACTER** and *AIPS*' **HOLLERITH** variables, and **A2WAWA**, **H2WAWA**, and **WAWA2A** for converting between individual *AIPS* variables and WaWa-IO "namestrings". Subroutine **CATKEY** implements the extension of *AIPS* headers to allow arbitrary "keyword equals value" pairs (#4977). Subroutine **IAMOK** implements a scheme by which *AIPS* disk data areas may be reserved for scratch files or for a list of individual users (# 4980). To correct an old error in judgement, the graphics area has been fully removed from the TV code by moving the **TK** parameters to the **DDCH.INC** include file and moving the **TK** image catalog functions to **TKCATL** (#4977). A number of other new subroutines also appear in **15JUL89**, including a vector index/gather routine called **QVINDE** (# 4984). The documentation of the overhauled *AIPS* will appear in time; some indications of this appear as entries # 4963, 5010, and 5011.

The writing of *uv* tasks has been affected by the new capability to store data in a compressed form. This form is basically a single weight and scaling factor for each sample of *uv* data, where a sample is all the correlators for a given antenna pair at a given time. Flagging is implemented via flag tables and/or magic values. The data are then stored as scaled 16-bit integers rather than floating point numbers. See # 4983.

The *AIPS* Code Overhaul

The *AIPS* code overhaul is nearly complete, with the exception of Z- and Y-routines for devices which NRAO does not own, and a few seriously non-standard tasks. We expect to complete most of these before 15JUL89 is released. The bulk of the transformations are done by three programs which we will supply with the 15JUL89 release. Fortran 77 allows declaration, equivalence, and common statements to occur in any reasonable order. Therefore, we have concatenated the include files for common and equivalence with the corresponding declaration files. Note that this cannot be done for DATA statements (V-type includes) which must follow all of the declarations. The first code-translation program is called CONINC. It is list-driven and is used to concatenate the appropriate C*.INC and E*.INC files to the D*.INC files. A VMS version of the program will be shipped in area AIPGVMS:, but the comments give the form one would use on other systems as well. A procedure for running the program is found in SYSVMS:. Note that many of the include files, which were used with single programs, have been incorporated into those programs as "local includes" and removed from the INCS: area (see below).

The second program, called XLATE, translates the code into more-or-less ANSI standard Fortran 77. In so doing, it

(1) checks INCLUDE statements, reporting non-standard ones, eliminating standard ones beginning with C and E, and changing ones beginning with I to begin with D,

(2) converts all declarations to ANSI-standard forms, reporting illegal ones such as BYTE and LOGICAL*1,

(3) eliminates declarations of FTAB (now in DDCH.INC),

(4) converts ENCODE statements into in-core WRITE and DECODE statements into in-core READ,

(5) corrects length of comment delimiters and declaration types in comments,

(6) converts CALL COPY (NWDPLI, *a*, *b*) into *b* = *a* statements,

(7) converts in-line function references to their generic names,

(8) reports any use of "Pseudo-I*4" variables, and

(9) reports any in-line comments.

The main effect of item 2 above is to eliminate all INTEGER*2 variables. The program XLATE.FOR is found in SYSAIPS: in generic form and in SYSVMS: in a VMS form, and a procedure to run it on VMS systems is called SYSVMS:XLATE.COM.

The third program is called XEDIT. It is a general text editor for Fortran that is driven by commands found in a text file. The nature of the changes made by XEDIT is controlled mostly by the contents of these command files, and at least two will be included in the new releases. As we currently use it, XEDIT

(1) inserts a copyright notice,

(2) does a variety of string substitutions to rename some of the WaWa subroutines, rename the catalog header variables, rename all 60 of the header pointers, correct Bill's spelling, etc.,

(3) converts character-handling calls to their most probable standard representation in either direct CHARACTER variables or in subroutine calls to convert between HOLLERITH and CHARACTER,

(4) changes ZMATH4 calls to straight arithmetic,

(5) changes about 50 call sequences, mostly to drop bytes/pixel and other obsolete arguments,

(6) logs numerous obsolete, illegal, or questionable things,

(7) changes variables to CHARACTER or HOLLERITH declaration based on contextual clues,

(8) changes to immediate CHARACTER and numeric constants rather than DATAed variables in most subroutine and function calls, and

(9) removes unused variables.

The goal here is to simplify the code and to take advantage of Fortran 77 as much as possible. Fortran 77 defines some limits on computer architectures, so we are choosing to accept those limits. Primarily, these show up in the lengths of variables. All numeric variables are the same length except DOUBLE PRECISION which we allow to be either one or two times as long as the basic unit. (The "one times" would be used in 64-bit computers.) Since everything is the same length, there is now no problem with constants in call sequences and we don't have to pass around so many length parameters. We are dropping several previously widely used, but now obsolete, system parameters such as NCHPFP and NWDPFP (the number of characters and integers per floating point). All of this fits into the overall goal of making it easier to code in *AIPS*. VMS versions of XEDIT.FOR and a procedure to run it are to be found in AIPGVMS: and SYSVMS:, respectively. The two command sets we have been using are called XEDIT1.STR and XEDIT2.STR and are found in SYSAIPS:.

Fortran 77 is weaker than other modern languages in its handling of character strings, in that they cannot occur with other data types in, for example, commons and I/O records. Thus, data structures such as the *AIPS* header are not allowed by the language definition. We are therefore required to define a non-standard variable type called HOLLERITH to hold character data within IO records and commons. A few simple operations may be done on HOLLERITH variables, but mostly they will be accessed only by the two routines (CHR2H and H2CHR) which convert between HOLLERITH and CHARACTER. The new *AIPS* uses CHARACTER variables essentially everywhere except for storage in data structures and all the old character/hollerith forms (1 or 2 per integer, 4 or NCHPFP per floating) are eliminated. The storage in HOLLERITH variables will be 4 characters per storage unit.

The new *AIPS* uses a pre-processor program to convert *AIPS*-standard code into ANSI-standard Fortran 77. The preprocessor changes HOLLERITH statements into something acceptable (REAL at the moment), does the INCLUDE function for external files in the INC: directories, and also supports a LOCAL INCLUDE option. This last eliminates the need to maintain separate task-specific INCLUDE files. Instead, the text to be included at several points in a program is entered into the beginning of the program file surrounded by LOCAL INCLUDE *'name'* and LOCAL END statements and then inserted where desired by INCLUDE *'name'* statements. The use of a preprocessor complicates debugging, since all routines to be debugged must be kept in their prepocessed form. We assume that most sites will not need the *AIPS* exported code in this form, and the installation procedures will not save the output of the preprocessor, nor compile for debugging. There is a new verb in AIPS called SETDEBUG which allows programmers to control whether a program is run in debug or nodebug modes. This has been a great convenience.

The conversion goes surprisingly well. There is a substantial amount of hand editing to clean up the output of XLATE and XEDIT, primarily in the area of character handling, but we have managed that fairly mechanically with a rather low rate of error. Many file formats have changed in small ways to take advantage of the larger integers and to correct any poor alignments between the logical and physical record lengths. These changes are being documented and will appear in the 15JUL89 release in the DOCTXT: area with names like MV2C06*xx*, where *xx* is the two-character file type. All references to integer images have been removed. This removed the need for four header variables, K8BSC, K8BZE, K2BPX, and K2INH, which have been eliminated. The other catalog header variables were renamed by changing the second character to I, R, H, or D depending on type, rather than the old length indications (2, 3, 4, and 8).

The overhaul of the Z- and Y-routines has required special care since many devices and operating system routines require 16-bit integers as inputs and outputs. In fact, we have taken this opportunity to complete the conversion of the Z-routines into a generic top-level, plus machine-specific lower-level, form. Before the overhaul, the UNIX Z-routines were mostly of this form, but the VMS Z-routines almost all had the older forms. We have also taken this opportunity to drop obsolete directory areas and support for essentially obsolete systems. At this writing, we have dropped the COS areas and all that remained of the ModComp areas. We intend to complete the overhaul of UNIX Z-routines, in part by dropping the Berkeley 4.1 and older Bell versions, before 15JUL89 is released outside the NRAO.

There are several reasons for giving high priority to this major, and perhaps overdue, change. Most important of these is the fact that 2-byte integer arithmetic has been found to be slower than 4-byte on both Vaxes and Convexes. On Vaxes, the difference seems to be about 10–30%, but it can be much larger on some vector computers. Most serious arithmetic in *AIPS* is done in floating point, but anything we can do to speed the code is worth some effort. Because of the debugging, we have not yet made precise measurements of performance, but users report that the new code is significantly faster, at least on the Convex. Careful runs of the DDT tests are planned for June 1989. A second reason for the conversion has to do with errors in Fortran compilers. Most errors, which we have been able to diagnose, arise in the handling of 2-byte integers. With this conversion, we may be able to compile all of the code with higher levels of optimization, gaining some additional performance enhancements. In the past, compiler errors have prevented us from compiling non-Q subroutines with optimization. We have not yet explored this area, since the TST version with which we have been working must be compiled for debugging, but we will do so soon. A third reason for the conversion is the limited range of 2-byte integers. Aborts for integer overflow were once a useful diagnostic, but the code is now more mature and we need to handle integers that are correctly larger than 32767. The value of doing this is illustrated by the new task HORUS (see changes # 4982 and 4984). Finally, many *AIPS* programmers wish to code in the "latest" Fortran standard. This they will be able to do, but we remind them that we have adopted a *limited subset* of the *strict* ANSI Fortran 77 standard. This does not include all of DEC's excellent enhancements, *i.e.*, those that extend the ANSI standard and are printed in blue ink in VMS manuals. Also *AIPS* will contain no Input/Output outside of Z-routines (except internal writes and reads).

In the overhaul, the following subroutines have been deleted since their functions are now obsolete: APXPO3, CHPAC2, CHPACK, CHXPN1, CHXPN2, CHXPND, CTINI, CONVF3, DECIND, DISPTV, DRBSMO, GRDTA3, I2TOR4, IREALP, IWPR, IZERO, KPACK, MAPFIX, MSCALE, MSCALF, MSCALI, PROMPT, R4TOI2, SNEVAL, and TBLIO. The CATCH* format translation programs were all deleted as well. A variety of obsolete tasks, listed in the previous section, were also removed. Subroutines renamed were COMOFF (formerly COMOF3), FSWTCH (FSWTC3), IOSET (IOSET*n*), MDISK (MDIS3), MINIT (MINI3), MINSK (MINS3), MSKIP (MSKI3), TSKBEG (TSKBE*n*), KWICK (QUICK), KWIKHD (QIKHDR), ZFIO (ZFI3), and ZMIO (ZMI3).

The image catalog block will now be referred to by standard names as much as possible. These are CATBLK (integer), CATR (real), CATH (Hollerith), and CATD (double precision). All "pseudo integer 4" is gone. Not including the changes to CHARACTER from HOLLERITH, the subroutines with changed call sequences include ANTDAT, COMOFF, CONDRW, CONFRM, COORDD, EXTINI, FNDCOL, FPARSE, GETROW, GTWCRD, IMCHAR, IMANOT, INTMIO, ISCALE, LSTHDR, MAPSIZ, MAPSNC, MINIT, MINSK, MSGHDR, NAMEST, PLNGET, PLNPUT, REIMIO, RNGSET, SETUP, TKLAB, UVINIT, WRBLNK, WRPLAN, and YCHRW. The program XEDIT, with the provided command sets, attempts to make all these call sequence changes plus changing the many call arguments that have become CHARACTER. It also attempts numerous string substitutions and logs various probable points of confusion or error. The lists of routines given above must be regarded as approximate; they are certainly not complete.

AIPS Site Survey

The 1988 *AIPS* Site Survey questionnaires were returned before our cut-off date (9 March 1989) by 143 Contact People (74% of the total); 37 others had responded to earlier surveys (21 in 1987 and 16 in 1986). We therefore have some data for 180 *AIPS* sites (93% of the total). The survey identified 153 machines that were actively running *AIPS*, of which 143 were outside the NRAO.

The data have been processed by Alan Bridle and Nancy Wiener, and the results are given in *AIPS* Memos 59 (summary and planning memo) and 60 (the Site Directory). Memo 59 should interest anyone

who wants to review recent hardware trends in the *AIPS* community and to see how these are influencing the NRAO's planning. Memo 60 will interest Site Managers who have hardware or applications that differ from the NRAO's and who wish to get in touch with sites that share their particular problems.

Conclusions

Our main conclusions from this year's survey can be summarized as follows.

1. The *AIPS* user communities served by VMS and by UNIX are both continuing to grow. But although 66% of active *AIPS* machines *by number* run under VMS, 67% of the machine *power* that is in use for *AIPS* is now under UNIX. Much of the recent growth in *AIPS* machine power around the world is based on inexpensive UNIX-based workstations (especially Suns) and on UNIX-based "mini-supercomputers" such as Convexes and Alliants. The dominance of UNIX in machine power can be expected to continue unless a cost-effective vector register VMS machine reaches the marketplace. Nevertheless, many *AIPS* sites will be attached to VMS for the foreseeable future, so both UNIX and VMS implementations of *AIPS* will be fully supported by the NRAO.

2. There is a little over six times as much machine power devoted to *AIPS* use outside the NRAO as inside. The total *AIPS* machine power accounted for by this survey is the equivalent of almost two Cray X-MP processors (or of 14 Convex C-1's) working full time, with a total of about 124 Gbytes of disk space available to *AIPS*.

3. VLA data reduction accounts for 56% of all *AIPS* use. Exporting the code from the NRAO has quintupled the CPU capacity used for processing VLA data in *AIPS* — the total machine power used for VLA data processing under *AIPS* is now the equivalent of rather more than one Cray X-MP processor running full-time. Unfortunately, however, even the most active sites still provide their *AIPS* users with combinations of disk space and CPU resources that are modest when compared with the needs of the more demanding VLA data processing projects.

4. The total machine power devoted to *AIPS* data processing in the U.S. outside the NRAO has more than tripled since 1986, but the average *AIPS* machine power *per user* in the U.S. is lower than that in Sweden, Japan, the Federal Republic of Germany, the Netherlands, Australia, the U.K., and Brazil.

5. The number of Sun workstations in use for *AIPS* grew from 8 in 1987 to 23 in 1988. Fortunately, this "Sunrise" in the user community has coincided with dedicated access to an NRAO Sun by *AIPS* programmers, so the NRAO staff can now provide better-informed support to *AIPS* users who have Sun systems.

6. The rate of growth of the number of *AIPS* installations is slowing, presumably due to saturation of the radio astronomy "market" for such code. The growth may therefore become less difficult to manage in the future.

Miscellany

Some further points from the survey are listed here because they may be of general interest to *AIPS* users and/or site managers:

(a) Fifteen *AIPS* sites stated that they are using VMS Version 5.0 or higher; none has reported significant difficulty with installing *AIPS* under this revision of the operating system.

(b) The recent relatively high growth rate of *AIPS* machine power in the U.S. partly reflects the slow response time of the U.S. sites (and/or their funding agencies) to the advent of vector register machines that are suitable for running *AIPS*. The NRAO sites and many foreign sites that now have vector register

machines had installed them by the time of our 1986 survey. Most of the U.S. sites that now have such machines installed them after 1986.

(c) No new *AIPS* installations with separate AP's appeared in 1988, and 5 were removed from *AIPS* service. The fraction of the active *AIPS* machine power represented by systems with separate AP's declined from 55% in 1985 to 13% in 1988, and the absolute machine power contributed by them has also declined.

(d) The number of active *AIPS* machines that have *no* vector hardware increased by 20 since 1987. Seventy-five percent of all *AIPS* installations rely entirely on the scalar code performance. The importance of such "naked" scalar machines to *AIPS* users stems from their low entry-level costs and the fact that they offer the users a large and *predictable* share of their resources. For many users, this offsets the fact that many of them cannot handle the most computationally-intensive data reductions in reasonable times. Their users either avoid these tasks, or do them elsewhere. The naked scalar machine count is dominated by MicroVAXes and Sun workstations.

(e) The mean memory size on active *AIPS* machines has increased from 7.7 Mbytes in 1985 to 17.9 Mbytes in 1988; 32% of active *AIPS* machines now have 16 or more Mbytes of memory. Although some of this improvement is offset by increased demand by operating systems, an increasing fraction of all *AIPS* sites can take advantage of *AIPS* tasks that use larger memory resources effectively.

(f) The total disk space available for *AIPS* worldwide, about 124 Gbytes, corresponds to about 0.6 Gbytes per ***simultaneously active*** *AIPS* user. This average disk resource per simultaneous user is inadequate for a wide range of VLA data reduction projects, and will also be inadequate for many VLBA projects. Many of the more powerful machines that are heavily used for *AIPS* are badly under-equipped with disk relative to the needs of individual VLA projects, which may need 1 Gbyte of disk for reductions that take several days of CPU time, even in a Convex C-1 or Alliant FX/8.

AIPS Publications

The Order Form at the end of this *AIPSLETTER* may be used to order the following memoranda and books. All previous memoranda are also available. Note that the *COOKBOOK* and *Going AIPS* listed are old, pre-overhaul versions at this time. A new *COOKBOOK* chapter dealing with calibration is in the late stages of preparation.

AIPS Memo No. 59: "The 1988 *AIPS* Site Survey," Alan Bridle, Nancy Wiener, March, 1989.

> We use data from the *AIPS* Site Surveys to assess the size and geographical distribution of the machine power actively devoted to *AIPS* data processing, and its growth between the surveys. We discuss some consequences for planning the NRAO's *AIPS* effort.

AIPS Memo No. 60: "The 1988 *AIPS* Site Directory," Nancy Wiener, Alan Bridle, May, 1989.

> We tabulate survey data for 158 *AIPS* sites with 214 machines whose Contact Persons have responded to at least one of the three last Site Surveys (1986, 1987, 1988) and who have indicated willingness for their site's data to be published. The intent is to provide a listing of "who has what and where" in a form that should help the *AIPS* user community to locate others with similar hardware and interests.

AIPS Memo No. 61: "The Astronomical Image Processing System," Eric W. Greisen, September, 1988.

> The design of the NRAO's Astronomical Image Processing System, *AIPS*, is discussed from a system-designer's point of view. The document constitutes an extensive introduction to the user and programmer aspects of the system.

AIPS Memo Series — Partial List

#	Date	Title, Author
3	80/09/23	Adapting RANCID to the U. Minn CDC CYBER 74, Frank Ghigo (U. Minn.)
6	81/08/05	Spectral line wish list for *AIPS*, Arnold Rots
9	82/04/01	Proposed NRAO Image Storage Unit, Ray Escoffier
10	82/04/29	Spectral line matters in *AIPS* and easy I/O, Arnold Rots
11	82/06/30	A computer-assisted astrometry system, Don Wells
18	82/09/02	Suggested changes in *AIPS*, Tim Cornwell
19	82/10/01	Suggestions for spectral line software, Walter Jaffe
20	82/10/05	Image display software in *AIPS*; DICOMED, Arnold Rots
21	82/10/08	*AIPS* wish list; version 1.0, Ed Fomalont
22	82/10/18	Timing of *AIPS* mapping software, Ed Fomalont
23	82/12/08	New *AIPS* code, Arnold Rots
24	82/12/10	Some *AIPS*-Pipeline discussions, Ed Fomalont
25	83/02/23	EXPLAIN files, Ed Fomalont & Tim Cornwell
27	83/05/20	Non-Linear Coordinate Systems in *AIPS*, (Corrected & Revised 83/11/15) Eric W. Greisen
29	83/11/30	Array Processor Memory Size, W. D. Cotton
30	83/12/02	*AIPS* and Array Processors, Bill Cotton & Don Wells
31	84/07/xx	Polynomial Approximations to Discrete Functions, Harvey S. Liszt & Eric W. Greisen
33	85/01/30	Gridding Synthesis Data on Vector Machines, Donald C. Wells & William D. Cotton
35	85/06/01	*AIPS* GRIPES Procedures, Donald C. Wells, Eric W. Greisen, & Nancy D. Wiener
36	85/06/24	Certification and Benchmarking of *AIPS* on the VAX-8600, Donald C. Wells, Gary A. Fickling, & William D. Cotton
38	85/12/24	Certification and Benchmarking of *AIPS* on the CONVEX C-1 and Alliant FX/8, Kerry C. Hilldrup, Donald C. Wells, & William D. Cotton
39	86/01/25	Shareable Images for *AIPS* under VMS, Pat Moore & Gary Fickling
40	85/11/08	The *AIPS* Workshop, Alan H. Bridle
41	85/12/05	I/O Speeds on a VAX 11/780, R. G. Noble (visiting from NRAL, Jodrell Bank)
42	86/04/04	Pseudo Array Processor Speed, W. D. Cotton
44	86/04/19	Benchmarking *AIPS* on a VAX-8600 with FPS-120B Array Processor, Donald C. Wells, Gary A. Fickling
46	86/05/20	Additional Non-linear Coordinates, Eric W. Greisen
47	86/08/22	Installing NRAO's *AIPS* on Vector Computers, Don Wells
48	86/09/22	Benchmarking *AIPS* on a VAX 8600, Mark Calabretta & Paul Rayner (CSIRO Division of Radiophysics)
49	87/02/13	The *AIPS* Wishlist (Update), Eric W. Greisen
50	87/05/01	1986 *AIPS* Site Directory, Don Wells, Alan Bridle, Nancy Wiener
51	87/05/15	The NRAO *AIPS* Project — A Summary, Alan H. Bridle
52	87/06/09	The 1986 *AIPS* Site Survey, Alan Bridle, Don Wells, Nancy Wiener
53	87/10/08	The 1987 *AIPS* Workshop, Alan H. Bridle
54	87/11/16	The MAIL-REMINDER Utility for VAX/VMS, Pat Murphy
55	87/10/15	The *AIPS* Wishlist (Update), Eric W. Greisen
56	88/04/11	The 1987 *AIPS* Site Survey, Alan Bridle, Don Wells, Nancy Wiener
57	88/04/29	1987 *AIPS* Site Directory, Don Wells, Alan Bridle, Nancy Wiener
58	89/01/25	*AIPS* Benchmarks on the CLSC and PSC Cray X-MPs, Kerry Hilldrup
59	89/03/28	The 1988 *AIPS* Site Survey, Alan Bridle & Nancy Wiener
60	89/05/04	1988 *AIPS* Site Directory, Nancy Wiener & Alan Bridle
61	88/09/12	The Astronomical Image Processing System, Eric W. Greisen

An Arrival

Christopher Ashley Hilldrup was born 12:42 p.m., Sunday, 30 April, 1989 at the University of Virginia Hospital. Birth weight was 3820g (8 lb, 7 oz). June and Christopher were discharged the next day and both are doing just fine — and Kerry seems to be holding up, too.

AIPS Sunrise

Several Sun-3 and Sun-4 sites have reported multiple problems while attempting to install *AIPS* under Sun-OS 4.0 and 4.0.1, in addition to the problems already known under Sun-OS 3.*x*. Some sites have submitted workarounds for the problems that they've managed to solve, and these are greatly appreciated. The UNIX version of the *AIPS* Installation Guide attempts to steer installers around the known vendor-specific problems with suggestions and recipes. Until recently, however, NRAO's first-hand experience with *AIPS* under Sun-OS 4.0 has been limited. Kerry has recently installed **15APR89** on a Sun 3/50 at NRAO as well as **15JAN89** on a Sun 4/280S at a non-NRAO site, both under Sun-OS 4.0.1. Since the *AIPS* Group has been preoccupied with the code overhaul, the **15JAN89** and **15APR89** releases are effectively the same. The problems that were encountered, and suggested workarounds for them, have been documented in the UNIX version of the *AIPS* Installation Guide and will also be broadcast as a BANANAS mail message. The *AIPS* source code overhaul should solve most of these problems, and sites are strongly encouraged to update to the **15JUL89** release as soon as possible. The remaining problems are probably due to bugs in the 4.0 or 4.0.1 operating system or compiler. We understand that Sun-OS 4.0.3 is scheduled for release soon and may include fixes to remaining *AIPS*-related problems. Before **15JUL89** installation kits are shipped, we hope to install the overhauled code under Sun-OS 4.0.*x* on both a Sun-3 and Sun-4 system.

One problem encountered on both Sun-3 and Sun-4 systems was due to the Sun FORTRAN 1.1 compiler introduced with Sun-OS 4.0. The problem takes the form of an execution error where computed `GO TO` statements fail if the test argument is an `INTEGER*2` variable. We have encountered this problem on several different systems over the years, including our original Convex port (1985). Since the **15JAN89** release, the `SYSUNIX` area has included a special version of the source code preprocessor script (`PP`) plus the required `sed` scripts that will transform computed `GO TO` statements into an equivalent set of `IF`'s and `GO TO`'s.

Like many recently introduced RISC architectures, Sun-4 systems are particularly sensitive to alignment problems. In *AIPS* code, these are usually forced by `EQUIVALENCE` statements and are reported by the compiler. Unlike its predecessor, Sun's FORTRAN 1.1 provides a `-misalign` option which allows misaligned data in memory. This, however, should only be used when necessary since it produces "very much slower code." Argument type mismatches at procedure interfaces are also a problem on Sun-4 systems and other RISC architectures. However, these are only detected at execution time (*e.g.*, as "bus errors"). These mismatches can include apparently acceptable constructs such as passing an `INTEGER*2` dimensioned 2 where an `INTEGER*4` was expected.

Since all computed `GO TO` failures, alignment problems and type mismatches at procedure interfaces encountered have involved the use of `INTEGER*2`, they should disappear in overhauled releases of *AIPS*, but some other problems may persist. Among these are the failure of "fast" copies in `CHCOPY`, the failure of partial-record reads in `ZTPMI2`, the failure in closing second-buffer file descriptors in `ZTPCL2`, and a number of missing symbols reported in the link-edit process.

Cartridge Tapes

The good news is that we have been experimenting with quarter-inch cartridge installation tapes. The early results are encouraging, so we have added a tape "density" called `QIC 24` to the *AIPS* Order Form at the end of this *AIPSLETTER*. At the moment, our standard 2400-foot, half-inch UNIX master tapes are simply copied from one of our Convex drives across an Ethernet connection to a Sun-3 quarter-inch cartridge drive. We use the QIC 24 recording format and a 600-foot cartridge (DC600A or DC600XTD) which means a storage capacity of about 60 Mbyte. These cartridges cost approximately three times as much as the traditional tape reels (that have roughly 3 times the storage capacity at 6250 bpi). Our experience to date has been limited to copies of the UNIX `tar`-format installation tape which contains source code only (about 40 Mbyte) and fits nicely on one cartridge. Such an installation tape has recently been read on a Compaq 386S running UNIX. This and other evidence suggests that QIC 24 is the most commonly available recording format and it is available on our Suns. However, the QIC 120 (125 Mbyte), QIC 150 (150 Mbyte), or QIC 320 (320 Mbyte) format(s) may become common in the future.

The bad news is that, although quarter-inch cartridge installation tapes can be requested and should work with local tape utilities such as `tar`, *AIPS* itself cannot support an interface to quarter-inch tape cartridge drives for *uv* and image data. These devices (or the drivers for them) all seem to be incapable of backward motion (apart from rewind). That is, you can neither backspace a file nor backspace a record, and *AIPS* tape-oriented applications depend on these functions. (You cannot forward-space a record, but this is not critical for *AIPS* purposes.) Barring unforeseen developments, none of this is likely to change soon.

CHANGE.DOC: 15APR89 Version

4922. *February 1, 1989* UVCOP *Bill C*
Fixed bug which caused no data to be copied unless both **ANTENNAS** and **BASELINES** were fully specified.
Moved change to **15JUL89** same date.

4923. *February 6, 1989* FILLM *Phil*
Removed "informative" message about **NX** tables which remained from the debugging stage.
Moved change to **15JUL89** same date.

4924. *February 6, 1989* CANPL *Chris*
A new task to produce plots for Canon LBP 8 series laser printers submitted by the Starlink project in the UK (programmers Robert Laing, Steve Unger, Richard Prestage and Chris Flatters). This required some new Z-routines (derived from the QMS equivalents): **ZCANIO** in **APLGEN**, **APLUNIX** and **APLVMS** and **ZCANCL** in **APLUNIX**. Also added **ZCANCL** scripts in **SYSUNIX** and **SYSNRA01** (the latter is a dummy script for debugging purposes).
Moved to **15JUL89** this date.

4925. *February 10, 1989* DATGET, SMOSP, SETSM *Phil*
Modified the smoothing routines so they would smooth the whole spectrum all the time, and switched the place at which smoothing is done in **DATGET** to before the calibration step.
Moved to **15JUL89** this date.

4926. *February 10, 1989* POSSM *Phil*
Slightly changed the frame plotting routine so that channel 1 is the first channel plotted rather than starting at 0; makes the plot look nicer.
Moved to **15JUL89** this date.

4927. *Febraury 12, 1989* FILLM *Phil*
When a scan crossed midnight, the day offset number was being added to the time flag just prior to midnight as well as those just after. Fixed it.
Moved to **15JUL89** this date.

4928. *February 24, 1989* — CANPL — *Chris*

Changed VAX-specific calls to IIABS and IISIGN to the generic intrinsic functions ABS and SIGN. The VAX extensions caused linkage problems on the Suns.
Moved nowhere.

4929. *February 27, 1989* — BPASS — *Phil*

Due to a bad call argument, BPASS was failing if there were more than 128 channels in the database. Added history entries for the solution interval and channel numbers. Modified the section which writes the BP table to write dummy entries (*i.e.*, all 1's and 0's) for flagged antennas/polarizations/IF's. This simplifies things in the application of the BP table.
Moved to 15JUL89 about this date.

4930. *March 1, 1989* — LISTR, LISTR.HLP — *Phil*

Fixed minor bug which caused all phases to be zero when user asked for ampscalar averaging and column listing. Modified the help file to make more explicit the fact that mixed output forms (*i.e.*, amp+phase, phase+rms) are only allowed with matrix listings. Also added traps to ensure that no attempt is made to take the square root of a negative number.
Moved to 15JUL89 this date.

4931. *March 3, 1989* — POSSM — *Phil*

When plotting BP tables whose amplitude is 1.0 and phase is 0.0, *i.e.*, "blank" entries, the scaling for the plot was blowing up. Fixed so this doesn't happen.
Moved to 15JUL89 this date.

4932. *March 6, 1989* — BPASS, BPINI — *Phil*

Made several small fixes to BPASS and one to BPINI to enable them to cope with multi-IF spectral line data.
Moved from 15JUL89 this date

4933. *March 9, 1989* — TABBP, BPASET — *Phil*

Changed the call sequence to TABBP to enable it to cope with multi-IF line data, so had to change BPASET and POSSM to reflect this. Relinked everything that knows about TABBP and BPASET.
Moved to 15JUL89 this date.

4934. *March 9, 1989* — FITTP — *Phil*

The number of bytes/characters in the MAXIS1 card of the FITS headers was being written with an I3 format. This was useless for most BP tables; changed it to I8. Also increased buffer size for BP tables.
Moved to 15JUL89 this date.

4935. *March 10, 1989* — GETSOU — *Bill C*

MSGSUP was set to 32000 and not reset to the previous value. This caused messages in the task not to appear after the call to GETSOU.
Moved nowhere (already fixed in 15JUL89).

4936. *March 13, 1989* — CLCOR — *Bill C*

Fixed a problem caused by a conflict arising from using the same loop for OPCODE='POLR' and 'PHAS'. The phase correction was not being done correctly for 'PHAS' and LCP.
Moved to 15JUL89 this date.

4937. *March 14, 1989* — CALIB — *Bill C*

Fixed call to CALREF for LCP in CLBADJ. Phases weren't being re-referenced for LCP.
Moved to 15JUL89 this date.

4938. *March 14, 1989* — DDT package — *Chris*

The DDT benchmark has been revised to include a new "large" problem (data supplied by Alan Bridle) that is more representative of large, high dynamic-range mapping problems than the original Liszt/Greisen data set. Clean components are now merged before running ASCAL on the "large" data set to prevent ASCAL from dominating the benchmark timings as happened with previous versions of the DDT test. In addition, DDT no longer requires the master tape to begin with the text files DDT.HLP, DDTSAVE.HLP, DDTLOAD.001 and DDTEXEC.001; the presence of these files was unnecessary as they are part of the normal *AIPS* distribution. Furthermore, the NNOISE adverb used by VTESS is now set separately for each problem. The single value of NNOISE used previously was giving rise to convergence problems (the "small" problem did not converge, while VTESS ended after zero iterations on the "large" problem); VTESS now converges for all three problems. Finally, occurrences of VM in the documentation have been changed to VTESS. Files modified are: RUNSYS:DDTLOAD.001, HLPFIL:DDT.HLP and DDTSAVE.HLP.
Moved to 15JUL89 on March 15, 1989.

4939. *March 16, 1989* — TABBP, BPASET, DATBND, POSSM, BPASS — *Phil*

The flagging of BP tables was not being handled correctly in the case of a whole spectrum being flagged. The routines now flag the data being corrected if the BP entry is flagged. Changes were made in the above routines and all tasks capable of doing bandpass corrections were relinked.
Moved to 15JUL89 this date.

4940. *March 21, 1989* — ZSTRTA in AIPGUNIX — *Kerry*

As threatened several releases ago, a call to ZSTRTP has been added. ZSTRTP is designed to set the execution priority of the current process based on its *POPS* number. It does this by trying to extract the desired execution priority from an environment variable with a name of the form PRIO*n*, where *n* is a *POPS* number. If no such environment variable exists, ZSTRTP does nothing. Also, since elevating execution priority requires superuser privilege in the UNIX world, ZSTRTP will issue a message to this effect and do nothing if this is attempted and the calling executable is not owned by root with its setuid bit enabled.
Moved change to 15JUL89 same date.

4941. *March 21, 1989* — ZCREA2 in APL4PT2 — *Kerry*

The calculation of free disk space has been changed to use the fundamental block (fragment) size for the file system as obtained via statfs. It had been using the optimal block size for transfers on the file system as obtained via stat. This was not always the same as the fundamental block size and could result in bogus insufficient space error returns when (ironically) a large file system was very empty (because the calculation saturated 32 bits).
Moved change to 15JUL89 same date.

4942. *March 23, 1989* — UVIMG, Catalog listing — *Eric*

Changed UVIMG to avoid flagged data and to use I polarization by default. Before, it used RR as a default, but could include flagged RR data when the LL polarization was not flagged. Changed CATLST to use a wider format for catalog number and sequence number.
Moved changes to 15JUL89 this date.

4943. *March 30, 1989* — UTESS — *Chris*

Changed code in GETIN handling default IN2CLASS, OUTCLASS and OUT2CLASS. Default IN2CLASS is now 'IBEM' in all circumstances; default OUTCLASS and OUT2CLASS are now '*x*UT' and '*x*UTC', respectively, if INCLASS is '*x*MAP', where '*x*' is any character, and 'UT' and 'UTC' otherwise. This prevents UTESS from rejecting dirty maps with INCLASSes QMAP, UMAP or VMAP when IN2CLASS, OUTCLASS and OUT2CLASS are not all explicitly set.
Moved change to 15JUL89 later.

4944. *April 2, 1989* — BPASET, BPGET — *Phil*

Fixed logic error in handling of flagged BP tables.
Moved change to 15JUL89 same date.

4945. *April 4, 1989* — DATGET — *Chris*

Corrected faulty logic in handling deselected antennae. DATGET would previously return data from baselines where only one antenna was deselected; it now returns data only if neither antenna has been deselected.
Moved change to 15JUL89 by Phil.

4946. *April 24, 1989* FILLM *Phil*

Made the check on the compatibility of two files being glued together when the 2nd tape is being appended to the first a little more comprehensive. Now checks that the frequency difference of the two files is less than 1% rather than 1 MHz.
Moved change to 15JUL89.

4947. *April 25, 1989* ADDIF — new task *Phil*

A little task to add the IF axis to a catalog header so that data calibrated on the Dec-10 can be concatenated with data calibrated in *AIPS*.
Moved to 15JUL89 this date.

4948. *April 27, 1989* Sun Screen Server *Eric*

Changed the graphics color to a purple. The green color did not become visible on black and white monitors, while the purple does. Changed YSSS routines WINDOW and COLMAP.
Moved to 15JUL89 this date.

4949. *April 28, 1989* R3DTAB *Phil*

Increased the buffer size to cope with BP tables (could have sworn I did this before).
Moved from 15JUL89.

4950. *April 28, 1989* UVLOD *Phil*

Increased the buffer size being passed to MAKTAB, so it doesn't complain about BP tables.
Moved change to 15JUL89 by Eric.

CHANGE.DOC: 15JUL89 Version

4951. *March 29, 1988* FOURG *Phil*

Inserted a version of this old FOURG (suitably tidied up for *AIPS*) routine into the APLNOT area, since I now call it from a couple of tasks.
Moved nowhere.

4952. *March 29, 1988* VLBIN *Phil*

Modified so that the correct sky frequency is kept at all times. There was a potential problem if a source was observed more than once in a run and the subsequent sky frequencies were different from the sky frequency of the first observation. The frequency offset is now kept in the DOPOF column of the CL table. So to obtain the observed frequency at a particular time, the following formula must be used:

$$\mathtt{FRQ}(time) = \mathtt{REF_FRQ} + \mathtt{FOFF}(ifno) + \mathtt{SU_OFF}(ifno) + \mathtt{DOPOFF}(time)$$

where REF_FRQ is from the catalog header, FOFF is the frequency offset for the IF from the CH table, SU_OFF is the frequency offset for the source from the SU table, and DOPOFF is the frequency offset for the source and antenna from the CL table.
Moved nowhere.

4953. *March 31, 1988* VLBIN *Phil*

The error messages from a couple of subroutines lied about which subroutine they were in.
Moved nowhere.

4954. *April 3, 1988* VTV *Eric*

Changed TVOPEN and TVCLOS routines to do minor error checking and then call YTVOPN and YTVCLS, respectively. Renamed YTVOPN to YTVOP2 and YTVCLS to YTVCL2 in YARGS, YDEA, YIIS, YIVAS, YSSS, YV20, and YVTV directories. Moved the old text of TVOPEN and TVCLOS into the YGEN (generic) versions of YTVOPN and YTVCLS. These now handle the TV parameter/lock disk file and call the lower-level YTVOP2 and YTVCL2 to do the device-specific opens and closes. Created new YVTV versions of YTVOPN and YTVCLS to get the parameters over the wire without use of the lock file. This will allow TVMON to run on the same CPU as the VTV programs which invoke it. Otherwise, TVMON was blocked from access to the TV by the AIPS which called it. Also changed TVMON to use WHOAMI to determine the correct NTVDEV (TV number) to use. Now we need routines to start various TVMON*n* as needed as detached daemons.
Moved to Convex by midnight job as usual, to 15JUL88 7 April.

4955. *April 8, 1988* CONINC *Bill C*
Utility program to concatenate D*.INC, C*.INC and E*.INC files. Program is list driven.
Moved nowhere.

4956. *April 8, 1988* Code conversion procedures *Bill C*
CONFIL.COM and XLATE.COM generate the lists to run CONINC and XLATE under VMS.
Moved nowhere.

4957. *April 8, 1988* Everything *All*
Changed all Fortran, C, and Macro routines to upgrade to a new typing standard and to Fortran 77. See separate articles.
Moved nowhere.

4958. *April 19, 1988* FNDVAR *Tim*
This is the routine which stopped VTESS and UTESS from handling 4096x4096 images. It evaluates the filling factor of the u, v plane from the transform of the beam. Since it is not crucial, I have simply by-passed it for NY=4096. It should be fixed properly soon. It is here mainly to document what should be done for *e.g.*, the CRAY. Now seems to work on the Convex.
Moved to 15JUL88 this date by Eric.

4959. *April 21, 1988* H2CHR, CHR2H *Bill C*
New *AIPS* routines to convert from *AIPS* HOLLERITH strings to CHARACTER variables and vice versa.
Moved nowhere.

4960. *April 25, 1988* CANDY *Bill C*
Modified example to use ZTXIO rather than Fortran reads.
Moved nowhere.

4961. *May 5, 1988* XEDIT *Bill C*
Utility program XEDIT will do much of the work of the software conversion based on a list of instructions (XEDIT.STR). Also a VMS procedure to run the program (XEDIT.COM).
Moved nowhere.

4962. *May 17, 1988* RESCAL *Bill C*
New subroutine to rescale a cataloged image and update the catalog header.
Moved nowhere.

4963. *May 27, 1988* DOCTXT:MV2C06GA. *Bill C*
Redefined the internal structure of GA tables for the new word sizes.
Moved nowhere.

4964. *June 9, 1988* ANCAL *Bill C*
Changed adverb IN2NAME to INFILE and changed ZTOPEN to ZTXOPN to allow more general access to text files.
Moved nowhere.

4965. *June 16, 1988* WaWa IO overhaul *Eric*
Created three new subroutines: A2WAWA, H2WAWA, WAWA2A to convert between *AIPS* and WaWa-IO forms for the "namestring". In the overhaul, the WaWa namestring has become entirely CHARACTER*36 since mixing character-valued and real-valued variables is not allowed. These routines make it easy to switch between the full namestring and its component parts.
Moved nowhere.

4966. *June 16, 1988* New subroutines *Eric*
Created two more new routines: JTRIM returns the length of a character string after blank filling beyond any trailing null. REAVRT converts between REAL and a coded local integer form for numbers for machine-independent transport such as done by the Virtual TV.
Moved nowhere.

4967. *July 12, 1988* XEDIT *Bill C*
Fixed bug which caused XEDIT to blow up when parsing a call sequence in which the opening parenthesis is on a different line from the subroutine name.
Moved nowhere.

4968. *July 12, 1988* NMATCC *Eric*
New **FUNCTION** returns the position of the next character in a string not matching a specified character.
Moved nowhere.

4969. *July 15, 1988* XEDIT *Bill C*
Fixed numerous problems that occur when an @ character appears in the Fortran program. Also now translates lowercase Fortran characters to uppercase.
Moved nowhere.

4970. *July 20, 1988* XEDIT *Bill C*
Fixed problem in **LOGIT** finding the end of the line when the target string was inside quotes; the terminating "@" appeared to be in quotes.
Moved nowhere.

4971. *July 22, 1988* XEDIT *Bill C*
Allow ":" as a variable delimiter character in the dead variable removal routine. Also variables in call sequence will not be removed as dead even if they are not used. **PRTHOD** didn't check far enough for an **EOL**; it got into trouble if too many variables were redeclared. **LINOUT** had a bug breaking long lines which were indented past the 10^{th} column; it went into an infinite loop writing blank continuation lines.
Moved nowhere.

4972. *August 2, 1988* XEDIT *Bill C*
Fixed a couple of bugs associated with the call sequence processor. All input Fortran lines are now read by a single routine which *ATPS*ifies (converts to uppercase) and does the string substitutions. Previously, continuation lines read by the call sequence processor had neither of these operations done.
Also fixed a problem problem which occured in the call sequence processor when several lines were to be written and there was an **IF** (...) before the call to be processed. Now an **IF** (...) **THEN** — **END IF** construction is used. Also, several problems which prevented some cases of multiple call sequence processings on the same line were fixed.
Moved nowhere.

4973. *August 15, 1988* XEDIT *Bill C*
Variables named **DATA** were causing **DATCHR** to try parsing the following text as a **DATA** statement. Now **DATA** must be preceeded by a new line and 6 blanks. Also fixed bug in **FNDDCL** which caused short **REAL** declaration lines to include the next declaration. This was causing the dead variable removed to remove the next declaration type.
Moved nowhere.

4974. *August 19, 1988* XEDIT *Bill C*
Several **EXTERNAL** statements followed **DATA** statements which caused the Sun compiler to barf.
Moved nowhere.

4975. *September 8, 1988* RESCSL *Bill C*
New subroutine to rescale SLice-file data.
Moved nowhere.

4976. *October 10, 1988* VFC.COM, VFC4K.COM *Bill C*
Put back functional versions of these command procedures designed to translate routines written in FPS' Vector-Function-Chainer language for array processors into "executable" Fortran subroutines. **VFC.COM** links the module with the appropriate libraries for 120B AP and **VFC4K** for 5000 series APs.
Moved nowhere.

4977. *November 3, 1988* CATKEY, TKCATL *Eric*
New subroutines: **CATKEY** reads and writes "keyword = value" pairs into the secondary section of the image header. **TKCATL** replaces all subroutines which were used to manage the graphics image catalog. Now graphics tasks do not require any knowledge of TV parameters, and **TKPL**, **XPLOT**, **XGAUS**, *et al.* have been moved from **YPGM:** to **APLPGM:**.
Moved nowhere.

4978. *November 4, 1988* XEDIT *Bill C*
Fixed bug which occurred when trying to parse the subscript of an unsubscripted variable. If no "(" occured on the line then the next line was read and lost if it was not a continuation of the previous line. The bug was fixed, and **PARSE** now tries to save an erroneously-read non-continuation line.
Moved nowhere.

4979. *January 23, 1989* XEDIT1.STR, XEDIT2.STR *Bill C*

Put the standard list of XEDIT commands in APLGEN:XEDIT1.STR and XEDIT2.STR. They should be copied to XEDIT.STR in the directory in which the conversions are to be done.
Moved from 15APR89 same date.

4980. *February 22, 1989* IAMOK *Eric*

New function subroutine: returns true if a specified file type is allowed on a specified disk. This routine applies the disk reservation system now established through the device characteristics common. Call IAMOK in order to establish that a file open or creation is allowed if you wish to avoid error messages. Otherwise, ZOPEN, ZCREAT, MCREAT, *et al.* will apply the reservation rules and generate any appropriate messages.
Moved nowhere.

4981. *March 14, 1989* SNPLT *Bill C*

New task. Plots amplitudes, phases, delays, rates or system temperatures from SN or CL tables with one antenna per plot and a user-selectable number of plots per page. Also SNPLT.HLP.
Moved nowhere.

4982. *March 28, 1989* Convex "AP Memory" size *Bill C/Kerry*

The amount of memory available to the Convex Pseudo AP was increased in INCVEX:DAPC.INC to allow FFTs of 1024x1024 images in memory and HORUS to make 1024x1024 images. Large FFTs should run significantly faster. Rearranged usage of memory in QVEX:QCFFT, QGRD4, QINT and QPHSRO. The overhaul seems to have cured the integer overflow problems which occurred the last time we tried this.
Moved nowhere.

4983. *March 31, 1989* Compressed *uv* data format *Bill C*

Introduced new, optional compressed *uv* data format. Visibility data are packed one correlator value per floating point word in a machine-dependent fashion. New Z-routines ZUVPAK and ZUVXPN pack and unpack visibilities. Compressed data has a single scaling and weight for each record (all data on a given baseline with a given time stamp) and the packed data are magic-value blanked.

This new format gives a data compression factor of 1.89 for VLA two-IF continuum data (8 correlations) and nearly 3 for line data bases with large numbers of channels. It was primarily intended that this format be used in uncalibrated data so the data can be expanded in the calibration routines, as many of the noncalibration *uv* tasks cannot deal with the compressed data. Added new adverb DOUVCOMP to indicate that data is to be compressed. Some individual changes are given below:

- UVGET — the principal, high-level calibration routine can now process compressed data allowing its use in all calibration package routines.
- FILLM — Will optionally write compressed data to disk.
- UVLOD — Will optionally write compressed data to disk.
- FITTP — Will write compressed data to tape in the usual formats.
- UVCMP — New task to convert between compressed and uncompressed formats.
- UVCOP — Will now accept random parameter weights and can copy compressed data.
- DBCON — Can concatenate compressed data files but cannot do a position shift or translate Stokes for compressed data.
- CMPARM — New subroutine to determine number blocks of data to be decompressed.

All tasks which interpret visibility data, but cannot uncompress the data, have traps and give error messages when they encounter compressed data.
Moved nowhere.

4984. *March 31, 1989* HORUS *Bill C*

New task; converts any array to a Horus-scope. Uses new uniform weighting and gridding routines (QNOT:UVTBUN and UVTBGD) which can process unsorted *uv* data to make images. The maximum size of the image depends on the amount of "AP memory" available (256x128 for an FPS AP and currently 1024x1024 for Convex C1s). Calibration and editing can be optionally applied. Bandwidth synthesis for continuum and full line cube imaging are supported. HORUS can process compressed data. Also HORUS.HLP and a new vector index or gather routine called QVINDE in QPSAP: and QFPS16:.
Moved nowhere.

4985. *April 3, 1989* TASAV *Phil*

New task. Creates a dummy *uv*-file and copies all extension tables to it. Uesful if just want to write tables to a FITS tape.
Moved nowhere.

4986. *April 4, 1989* — BPASS, BPASS.HLP — *Phil*

Added divide by "channel 0" option so users need not normally calibrate their bandpass data before determining the bandpass. Also modified the user inputs to be more consistent with other tasks.
Moved nowhere.

4987. *April 5, 1989* — FILLM, FILLM.HLP — *Bill C*

Added "Solar mode": if either the VLA observing mode is "S*" or VLAMODE='S*' and the calcode on the tape is ' ' then the data are divided by the "nominal sensitivity" and the "nominal sensitivity" is written in the CL table as the system temperature. In solar mode looking at calibrators, 1.0's are written in the CL table for system temperatures and the data are not modified. Also, FILLM now checks the band of the 2nd IF and doesn't put LL and LP data in the same file and splits continuum data if the bandwidths are different.
Moved nowhere.

4988. *April 6, 1989* — DBCON — *Bill C*

Added the capability to rescale the weights of the two input data sets and added a section to the DBCON.HLP file explaining how to determine the appropriate reweighting factors. Added new adverb REWEIGHT for the purpose. Modified DBCON to adjust different reference dates when DOARRAY is true to the earliest date. The times of the first CL and FG tables in each input file are adjusted as is the reference time in the AN table.
Moved nowhere.

4989. *April 6, 1989* — SWPOL — *Neil Killeen*

New task to reverse the polarizations of VLA data when the transfer switch has been thrown. Can process compressed *uv* data. Also SWPOL.HLP.
Moved nowhere.

4990. *April 6, 1989* — POSSM — *Phil*

Modified the scalar averaging option to vector average the phases, while scalar averaging the amplitudes and then displaying both.
Moved nowhere.

4991. *April 6, 1989* — MX — *Bill C*

Modified to read compressed (XY-sorted) data.
Moved nowhere.

4992. *April 7, 1989* — POSSM — *Phil*

Forgot to do a weighted average in the above improvement.
Moved nowhere.

4993. *April 8, 1989* — Bandpass routines — *Phil*

HORUS caused an error in the bandpass routines' handling of scratch files. It is capable of mapping multiple channels, but calibrates them in groups of 8. The BP routines could not handle the multiple passes and failed on the 2nd one as a second scratch file was opened up. Fixed UVGET, BPASET, BPGET, SELINI and HORUS to cope with this.
Moved nowhere.

4994. *April 11, 1989* — SPLIT — *Phil*

Added the option to write data in compressed format.
Moved nowhere.

4995. *April 12, 1989* — BPASS — *Phil*

Added the option to average all bandpass calibrators together across the whole timerange before solving for the antenna-based bandpasses.
Moved nowhere.

4996. *April 12, 1989* — VTESS family — *Chris*

Tidied up the handling of default file classes in LTESS, STESS, UTESS and VTESS. This was motivated by the fact that all of these tasks aborted with the message "CANNOT PROCESS Q,U,V DATA" if INCLASS was QMAP, UMAP or VMAP and any of IN2CLASS, OUTCLASS or OUT2CLAS were left blank, but not if the classes were set explicitly. In fact LTESS, STESS, and UTESS should not have rejected Q, U or V maps. None of the above programs now aborts if given a Q, U or V map (whatever its class name) although VTESS checks the coordinate reference value for the STOKES axis and will issue a warning if this corresponds to Q, U or V.
Moved nowhere; UTESS already changed in 15APR89.

4997. *April 14, 1989* VLBIN *Phil*

In the process of overhauling added the ability to write compressed data. Updated the help file and added APLGEN:ZVLBIN to do a needed data equivalence with 16-bit integers.
Moved nowhere.

4998. *April 14, 1989* VLA-specific procedures *Bill C/Bill J*

Added a RUN file to RUNSYS:, named VLAPROCS, which defines some procedures which are useful for calibrating VLA data. Also added a HELP file for each of the procedures:
VLACALIB — runs CALIB and LISTR to display results.
VLACLCAL — runs CLCAL and LISTR.
VLARESET — deletes all SN tables and all CL tables higher than version 1.
Moved nowhere.

4999. *April 19, 1989* ITBSRT *Chris*

Corrected the calculation of LENBU (the number of records in a buffer), which was being overestimated. This problem showed up in CCMRG on Cholla; a buffer overflow corrupted a number of variables used by UVINIT, causing it to abort. Other programs calling TABSRT (ANCAL, BPASS, CALIB, CVEL, INDXR, LISTR, SDCLN, TAMRG and TASRT) may have been affected in less obvious ways.
Moved nowhere.

5000. *April 19, 1989* DSEL.INC, SMOSP, SELINI *Phil*

SMOSP was not doing the Hanning smoothing correctly since it obtained the spectrum length from the CATBLK which changed underneath it. So added the original spectrum length to the DSEL.INC.
Moved nowhere.

5001. *April 19, 1989* UVPLT, UVPLT.HLP *Phil*

Modified task to plot uv data from multi-source files. This meant I had to include all the calibration adverbs in the help file. UVPLT will still plot XY-sorted data if no calibration is to be applied.
Moved nowhere.

5002. *April 20, 1989* LISTR, LISTR.HLP *Phil*

Added ability to list T_{sys} columns from the CL table. Updated the help file also.
Moved nowhere.

5003. *April 20, 1989* REFDATE *Bill C*

New character adverb to give reference day. Also POPSDAT.HLP, REFDATE.HLP, RUNSYS:NEWPARMS.001, INC:DAPL.INC.
Moved nowhere.

5004. *April 20, 1989* Spectral Smoothing *Phil*

Modified the spectral smoothing routines so that they don't smooth the whole spectrum when a channel range is requested; instead they now only smooth the channel range plus some guard channels on either side. The width of the guard band is governed by the width of the smoothing function. Required changes in DSEL.INC, UVGET, SETSM, SMOSP, and CMPARM.
Moved nowhere.

5005. *April 23, 1989* DGHEAD *Phil*

Was not removing the SOURCE random parameter when dealing with compressed data.
Moved nowhere.

5006. *April 23, 1989* SPLIT *Phil*

Modified slightly so that more rational things were done when writing compressed data.
Moved nowhere.

5007. *April 23, 1989* FITTP *Phil*

Changed default (at the urging of all VLA staff) to be 32-bit integer. Also changed FITTP.HLP.
Moved nowhere.

5008. *April 23, 1989* SNPLT *Bill C*

Added GNPLT-like option, OPTYPE='SUM', which does a one-page plot of amplitudes and phases of selected data all on the same plot. The most discrepant of the values selected for each antenna/time are plotted. Amplitude scaling is fixed (but selectable) and the phase plot is always autoscaled. This option is most useful for examining the results of self-calibration. Also made the plotted symbols larger. Also SNPLT.HLP.
Moved nowhere.

5009. *April 24, 1989* — IMLOD — *Phil*

Initialized the scaling and offset values — this will fix the ISCALE and IZERO in the header both being zero.
Moved nowhere.

5010. *April 24, 1989* — *Going AIPS*, Volume 1 — *Chris*

Volume 1 of *Going AIPS* has been converted to LaTeX format from DEC RUNOFF. Conversion was done using an automatic preprocessor, RNOTOTEX. The output LaTeX files were then tidied up to remove gross formatting errors introduced by the preprocessor and an index file was generated from the LaTeX .IDX file. New files are: GOAIPS.STY — defines page sizes and page numbering, GAVOL1.TEX — skeleton and title page of Volume 1, CHAP1.TEX to CHAP8.TEX, APPENDIXA.TEX, and INDEX1.TEX — index. These replace: GOINAIPS.INC, GAVOL1.RNO, CHAP2.RNO to CHAP8.RNO and APPENDIXA.RNO.
Moved nowhere.

5011. *April 24, 1989* — *Going AIPS*, Volume 2 — *Chris*

Volume 2 of *Going AIPS* has been partly converted to LaTeX. The Runoff files have been preprocessed with RNOTOTEX, but must be manually edited before a printable version of Volume 2 can be produced. New files are: GAVOL2.TEX — title page and skeleton, and CHAP9.TEX to CHAP16.TEX. These replace the corresponding .RNO files.
Moved nowhere.

5012. *April 24, 1989* — AKOPEN — *Tim*

AKOPEN had a bug whereby FNDVAR would fail for non-square images with premature EOF (ERROR=4).
Moved nowhere.

5013. *April 25, 1989* — POSSM — *Phil*

Added the option to divide data by channel 0 before generating the plot file. Also added the missing data selection adverbs QUAL and CALCODE. Also changed POSSM.HLP.
Moved nowhere.

5014. *April 25, 1989* — LISTR — *Phil*

Added check just after call to UVPGET to check sort order. LISTR now complains if sort order is not 'T*'.
Moved nowhere.

5015. *April 25, 1989* — UTESS, VTESS — *Tim*

A bug of unknown vintage caused UTESS to fail if BLC and TRC were not set to the default values. The image would slip over by a number of pixels each iteration and cause an abort when the image fell off the edge of the world. VTESS and UTESS did not check to see if BLC(3) was a reasonable value.
Moved nowhere.

5016. *April 27, 1989* — UVMAP — *Chris*

Added code to subroutine UVDISP to compensate for the fact that the base type of the grid file is COMPLEX while MINIT/MDISK assume that it is REAL. The failure to do this led to incorrect mapping of pixels in the TV display to those in the grid resulting in vertical stripes on the TV. Output maps were not affected. *Editors' note:* this was a bug due to the overhaul and not some long-standing problem.
Moved to Cholla this date.

5017. *April 28, 1989* — SPLIT — *Phil*

Several HI entries were missing; changed so that all relevant history is written.
Moved nowhere.

5018. *April 28, 1989* — Cholla shell scripts — *Chris*

Brought the master versions of SYSVLAC1:AIPS and SYSVLAC1:ASSNLOCAL.SH up to date (the versions actually used seemed to have been diverging from the copies kept in Charlottesville since Cholla moved from the VLA, if not before). Also added Bob Paine's Sun 3 (vsun1) to ASSNLOCAL as TV device 2.
Moved to Cholla this date.

5019. *April 30, 1989* — SPLIT — *Phil*

When changing things around in SPLIT previously, I forgot to ensure that the output file created by UVCREA was of the size appropriate for compressed data if required.
Moved nowhere.

AIPS Order Form

1. Name and address of Contact Person: _____

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   Version of UNIX system in use: _____
   N.B. we need to know this. *e.g.*, bsd4.*x*, Sys III, Sys V, V7, *etc.*
   (*AIPS*, neither UNIX nor VMS) . . . . ☐ FITS compressed text format
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5. Tape density desired: . . . . . ☐ 1600 bpi ☐ 6250 bpi ☐ `QIC 24` (tar only)

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April 15, 1989

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A I P S L E T T E R

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TEXset by EWG

AIPS Release Cancelled

The **15JUL89** version of *AIPS* is the first version of the "overhauled" code and also contains some major changes to the calibration and imaging software. It has been extensively tested at the NRAO. However, it has recently been found to contain some serious impediments to *filling* or *calibrating* certain classes of spectral-line data obtained with the VLA. We have, therefore, decided not to release this version of *AIPS* outside the NRAO.

We now plan that the next "public" release of *AIPS*, and thus the first of the overhauled code, will be the **15OCT89** version. We regret any inconvenience to users that is caused by not releasing the **15JUL89** version. We hope that the *AIPS* community will recognize the benefit of waiting for a release that has fewer known deficiencies.

Until spectral-line calibration alternatives are debugged in *AIPS*, VLA spectral-line users from outside the NRAO should plan to visit the Array Operations Center to calibrate their data using ISIS (which emulates the functionality of the VLA's "Pipeline" at the speed of the Convex C-1). The NRAO will *not* distribute or support the ISIS package outside the observatory, however. Please do *not* contact Miller Goss for copies of ISIS.

A need for an *AIPS* "user agreement" has arisen for several reasons. The most important is that we want all *AIPS* sites to obtain their copies of *AIPS* from the NRAO and thereby to be made aware of the restrictions that apply to their use of the code and to our support of it. For sites doing astronomical research, these restrictions are only to maintain the proprietary nature of the code and to direct third parties who wish to receive the code to the NRAO. We have decided to require such an agreement with each recipient of the *AIPS* code; it will be necessary for each site to complete and return a brief agreement form, signed by an authorized representative, before receiving its next release of *AIPS*. There will be no charge for the user agreement to any astronomical research users.

If you have any questions about the above, please contact Bob Burns at any of the addresses in the letterhead (use **bburns** rather than **aipsmail**).

Computer Positions Available

Green Bank:

The NRAO has an immediate opening for a Scientific Programming Analyst. The successful applicant will participate in an Observatory-wide effort to modernize its single-dish spectral line, reduction and analysis software. The NRAO is in the process of porting its existing programs to the SUN workstation environment. Using these workstations, we will embark on an extensive software development program in support of the new Green Bank telescope and other existing instruments.

Candidates should have experience with the Unix operating system, C and FORTRAN programming languages and have experience in a scientific programming environment. An advanced degree or demonstrated equivalent experience is also required. Familiarity with advanced workstation concepts, networking and radio astronomical data reduction techniques would be attractive.

The successful candidate will be based in Green Bank, West Virginia, where the NRAO presently maintains a major observing facility and where the world's largest steerable radio telescope will be constructed.

****

Charlottesville:

The NRAO is seeking an individual with an M.A. or Ph.D. in astronomy, preferably in radio astronomical spectroscopy, with interest and experience in applications programming. In addition to a knowledge of C and FORTRAN, the candidate should be proficient in the Unix operating system and have expertise in one or more of the following areas:

- Algorithm development for calibration/reduction/analysis
- Software system design
- Computer graphics/modeling

The NRAO will embark on an extensive software development program in support of the new Green Bank telescope and other existing instruments. The successful applicant will be involved in this effort. In addition, the job will carry responsibility for maintenance of the software systems in place at the Charlottesville, VA site; implementation of the new single-dish FITS data interchange standard; and development of code to support observations done with a new generation of multi-feed receivers and advanced spectrometers.

If the successful candidate has an active research program in radio astronomy or related astronomical areas, he/she will be encouraged to devote up to 25% of his/her time in self-directed research. Research that relates to radio astronomical spectroscopy will be particularly encouraged. This is not a tenure-track position and is not subject to the NRAO tenure "clock." Advancement to the rank of Associate Scientist or Scientist can be made on the basis of merit and professional development at any time. If the successful candidate does not wish to pursue an ongoing research program, an appointment could be made as a Scientific Programming Analyst.

The successful candidate will be based at the NRAO Central Office on the grounds of the University of Virginia in Charlottesville. This facility has a staff of 28 Ph.D. astronomers, engineers, and computer professionals with responsibility to all observing sites.

****

Tucson:

The NRAO has an immediate opening for a Scientific Programming Analyst. The successful candidate will assist in the development, coding, testing and implementation of a real time system to acquire data and control the operation of radio telescopes.

The initial appointment will be in Tucson, Arizona, where he/she will join a team currently implementing a new control system for the 12-meter millimeter-wave telescope on Kitt Peak.

After one year, the individual will transfer to the Observatory's Green Bank, West Virginia site to work on the GBT project. This is a project to build the world's largest steerable radio telescope. The individual will have the opportunity to play a key role in the design and development of this system.

The position requires at least a Bachelor's degree in computer science, astronomy, or physics and either several years of general programming experience, or at least one year of real-time experience. A working knowledge of the UNIX, VMS or similar programming environment, and an expert knowledge of the programming language 'C' is desired.

****

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Dr. W. R. Burns
Head, Computing
National Radio Astronomy Observatory
Edgemont Road
Charlottesville, Virginia 22903-2475

Summary of Changes: 15 April 1989 — 15 July 1989

There are 219 entries in the CHANGE.DOC file listed below. This is not a record, but certainly indicates a great deal of activity — both new code and bug fixes — as the code overhaul winds to a close. The collaboration between Bill Cotton, Phil Diamond, and our *AIPS* friends in Australia has been particularly productive.

Changes of Interest to Users: 15OCT89

Of all the new tasks in 15OCT89, the one that is likely to have the most impact is MK3IN. It reads raw correlator MKIII VLBI data from Haystack format "A" tapes and converts them to *AIPS* format in an astronomically useful time system. This makes all *AIPS* calibration available to MKIII data for the first time (see entry #s 5083, 5114). Not coincidentally, the fringe fitting in CALIB was corrected for multiple-IF data (#s 5081, 5082).

The calibration area, as usual, received the lion's share of the coding effort. The most extensive change was a redefinition of the multi-source *uv* data base to allow more than one frequency and bandwidth, within some limits. This requires considerable generalization in FILLM to read the data (entry # 5057). All calibration tasks must then read the new frequency (FQ) tables which describe the more general format and must provide three new adverbs, SELBAND, SELFREQ, and FREQID, to allow the user to select a subset of the data base for the current task execution. (See entry #s 5020, 5058–5062, and 5143). We had hoped to make the transition to FQ tables transparent to users, doing translations of old CH tables automatically, but there have been the inevitable problems anyway. Another overall change to the calibration was the addition of support for linear polarization of the form observed at the Australia Telescope (not that of the WSRT, entry # 5198).

New tasks in the calibration area include QUACK which does selective editing of data at the start and end of observation scans (# 5166). FARAD is another new task to apply Faraday rotation measure corrections to the data (# 5210). New service tasks are SETAN to translate a text file to an *AIPS* antenna file (# 5230) and UNCAL to remove on-line calibrations (presently only from data taken by the Australia Telescope, # 5235). The adverb OPTYPE was added to SETJY to allow for additional operations such as computing standard fluxes (# 5089) and resetting fluxes and velocities (# 5109). The option to plot the difference between the two circular polarizations was added to SNPLT (# 5022). TVFLG was changed to accept free-format input for the numeric parameters which it requires (# 5079).

Spectral-line calibration also received some direct attention. The new adverb CHANSEL is used to select ranges of channel numbers for an operation (# 5167). It was added to SPLIT to control frequency averaging (#s 5170, 5179, 5190) and to BPASS to control the calculation of "channel 0" (# 5203). The new task AVSPC uses this adverb to produce pseudo-continuum data sets by summing selected spectral channels (#s 5181, 5193). BPASS was also modified to use the same channels as used by the on-line system for "channel 0" (# 5089), to recognize polarization data, to print closure errors, and to do amp-scalar averaging prior to determining the bandpasses (# 5203), as well as to support the new FQ tables.

The display area also received some interesting improvements. The new task UVHGM makes plots of the statistics of values in a *uv* data file (# 5172). New task KNTR plots contours in an *AIPS* plot file, including the option to display more than one image in a single plot (# 5171). It is similar to CNTR in some ways, but uses an algorithm better suited to pen plotters (and fine for laser printers). Spectral-line plots for a specified region may be generated by the new task ISPEC as well (# 5238). Task GREYS was modified to label the intensity step wedge (# 5021). EXTLIST was improved and upgraded in a number of ways, including modifications to the plotting tasks designed to improve the EXTLIST display (#s 5147, 5021, 5126, 5131, 5135). In particular, new plot types are supported and the displays include the actual antennas or baselines for the given plot file for those tasks which produce more than one plot per execution.

The area of tapes also received some attention. **BAKLD** and **BAKTP** were overhauled and made more usable (# 5154). A serious bug which made all tapes of compressed *uv* data unusable was corrected (# 5216), and a pitfall for unwary users was removed (# 5227), in **FITTP**. A default was provided for the **NPOINTS** adverb (# 5055) in **UVLOD**. A bug affecting the positioning of tapes while being opened on Convex computers was corrected (# 5095).

Other areas of general interest include the new task **FETCH** (# 5173). It provides another, straightforward way to bring images into the *AIPS* system. The use of the "*AIPS* number" was changed to allow there to be more interactive **AIPS** users while still allowing for *AIPS* batch queues (# 5050). The help file **WHATSNEW** has been resurrected and should be of use (#s 5178, 5182)..

Changes of Interest to Programmers: 15OCT89

Programmers interested in the calibration area should study the wide-reaching changes brought about with the **FQ** tables (#s 5020, 5058–5062, and 5143). All calibration tasks require three new adverbs, **SELBAND**, **SELFREQ**, and **FREQID**. Several basic subroutines have had their call sequences changed; these include **CHNDAT**, **FRQTAB**, **CHNCOP**, **TABCAL**, **TABSN**, **TABBP**, and **TABNDX**. Several table files have had an extra column added, namely the **CL**, **SN**, **BP** and **NX** tables. Other useful tools in the *uv*-calibration area are **SETSTK**, to translate the user's **STOKES** value (# 5128, 5129), **REQBAS**, to translate the user's **ANTENNAS** and **BASELINE** adverb values (# 5043), and **WANTCH** and **AVGCHN**, to handle the new **CHANSEL** adverb (#s 5168, 5169).

The format of help files has also changed. They begin with a precursor section which gives a one-line description and keyword values as well as separator lines. Any line beginning with a semi-colon is now treated as a comment line in help files and is ignored (# 5115). The maximum number of interactive *AIPS* allowed is now 15 if there is no batch and 14 minus the number of batch queues if there is batch (# 5050). The system manager can set the limit lower than this. All service programs now have free-format inputs (# 5049). This makes a serious change in the format of the main input line to **POPSGN**, for example. Gripes may be sent to Charlottesville on tape using **GRITP** or turned into text form for e-mail using **GR2TEX**. Both of these were cleaned up and improved over the quarter (#s 5047, 5048).

The Z-routine areas of the code were simplified by dropping obsolete operating systems and distinctions. The Unix area is now divided into a Bell area, with Mascomp and Cray sub-areas, and a Berkeley area, with Alliant, Convex, Sun, and Vax sub-areas (# 5148, 5150, 5151). The midnight job was generalized to have separate "lastgood" dates for the separate portions of the job (# 5153). And, the VMS system translation of logicals was extended (# 5045) and the printing of a **NOTICE.TXT** file was added to the **AIPS** procedure (# 5228). The TV is now a logical rather than a symbol for VMS.

CHANGE.DOC: 15OCT89 Version as TST

5020. *May 3, 1989* — SELBAND, SELFREQ, FREQID — *Phil*

Added to POPSDAT.HLP, 3 new adverbs needed for the FQ table stuff. They (respectively) select data by bandwidth, frequency and FQ id number. Also help files for each. Also added the new adverbs to DAPL.INC and NEWPARMS.001. Moved nowhere.

5021. *May 5, 1989* — GREYS — *Eric*

Changed the handling of the step wedge so that it is plotted at the top or the right depending on DOWEDGE. If LTYPE is ≥ 3, the wedge is given ticks with intensity labels. The intensity range line at the bottom was retained, but changed to use metric scaling where possible. Cleaned up typing a bit and filled in more of the defaults before the plot file is created. This matters for EXTLIST. Added notes about the new capability to the help file.
Moved to 15JUL89 this date.

5022. *May 8, 1989* — SNPLT — *Chris*

Added a new STOKES option. If STOKES='DIFF', then SNPLT plots the differences between RCP and LCP solutions — a useful diagnostic for polarization work. Changed the help file to match.
Moved nowhere.

5023. *May 8, 1989* — PRTCC — *Chris*

Corrected implied do-loop ranges in output statements for non-point components. This prevents PRTCC from crashing when listing CC files with Gaussian components. Also tidied up the header for $101 \leq$ DOCRT < 120.
Moved to 15JUL89 this date.

5024. *May 8, 1989* — CONVL — *Chris*

Fixed a logic error in subroutine CONVOL. Although CONVOL was properly checking for fatal error returns (1–3) from CATIO, it was not resetting IERR if a non-fatal error occurred; any non-zero error status was caught by a later error trap giving rise to a misleading error message. As CATIO normally returns 6 ('Warning on READ, file writing') when CONVOL is called for the second plane (and all subsequent planes) of a cube, this bug prevented CONVL from handling data cubes.
Moved to 15JUL89 this date.

5025. *May 9, 1989* — ZI8IL — *Bill C*

Fixed indexing problem; it was picking up input at an address 1 byte higher than correct. This should have only affected IMLOD reading 8-bit images.
Moved to 15JUL89 this date.

5026. *May 9, 1989* — METSCA — *Eric*

Changed to capitalize the metric prefixes rather than put them all in uppercase.
Moved to 15JUL89 this date.

5027. *May 9, 1989* — MOMNT — *Chris*

Split two history file entries that were longer than 72 characters into two lines. The long lines caused MOMNT to crash on the Convex when it tried to squeeze them into a 72-character buffer. Also made the 'This is a very non-standard program...' message lowercase.
Moved to 15JUL89 this date.

5028. *May 9, 1989* — DUVII.INC, DSEL.INC, PUVD.INC — *Phil*

Modified to cope with the upcoming FQ tables.
Moved nowhere.

5029. *May 9, 1989* — DBCON — *Phil*

Modified so that common /CATHDR/ matched the necessary common in DUVH.INC.
Moved nowhere.

5030. *May 9, 1989* SUMIM *Chris*

In the loop to sum over images, H2WAWA was being called with an INTEGER sequence number rather than a REAL. As small integers look like zero on the Convex, when interpreted as floating-point numbers, the WaWa I/O system set the input file sequence number to zero in each iteration. This had the result that the file with the highest sequence number that had the given input name, class and disk number was repeatedly added to itself. The H2WAWA call was replaced by a call to A2WAWA, which also allowed the removal of several superfluous CHARACTER-HOLLERITH conversions.
Moved to 15JUL89 this date.

5031. *May 10, 1989* MX *Phil*

The maximum size of the beam was being calculated incorrectly in subroutine MXIN. This only showed up because the AP broke and we changed the maximum size of the AP to 32K words; the resultant beam calculation produced a number that was not a power of two.
Moved to 15JUL89 this date

5032. *May 10, 1989* POLISH *Eric*

Corrected bug which prevented ENDEDIT from being executed.
Moved to 15JUL89 this date.

5033. *May 11, 1989* Times in text tables *Bill C*

Added a new keyword, TIMEOFF, to the tables read by ANCAL and UVFLG. This allows the entry of times in UT (or other times) and gives a constant value to correct to IAT. This is needed for VLBI and VLBA use where the times are usually kept in UTC. ANCAL requires a value per antenna; UVFLG keeps the value until a new one is encountered. Also ANCAL.HLP and UVFLG.HLP.
Moved nowhere.

5034. *May 11, 1989* SL2PL *Chris*

Added code to check that a model exists before plotting model or residuals. Also corrected a bug in subroutine SLABEL that wiped out part of the plot title (including the image file name).
Moved to 15JUL89 this date.

5035. *May 11, 1989* UVFND *Chris*

Corrected the conversion of days into hours, minutes, and seconds.
Moved to 15JUL89 this date.

5036. *May 11, 1989* TELL *Eric*

Corrected GTTELL and AU2. Both the display of the SHOW and TELL queue and the TELL parameters were failing due to errors addressing the changed format of the file. Created missing OPTELL help file.
Moved to 15JUL89 this date.

5037. *May 11, 1989* Miscellaneous *Eric*

Changed ZTQSPY (GEN) and ZTQSP2 (VMS) to upper-lowercase headers.
Moved to 15JUL89 this date.

5038. *May 12, 1989* PRTTP *Chris*

Fixed the Fortran-77 character handing concerned with printing image file names. The file type, class and name had been concatenated into a single CHARACTER variable, apparently on the assumption that a WRITE statement could split this variable between 3 edit descriptors. Even if this were possible, the end index of the type substring was missing from the call which filled it, causing the file name and class to be overwritten with blanks.
Moved to 15JUL89 this date.

5039. *May 12, 1989* ZMOUN2 (VMS) *Eric*

Corrected error in ZMOUN2 which caused it to fail to detect previously mounted tapes under VMS.
Moved to 15JUL89 this date.

5040. *May 15, 1989* COMB *Chris*

Fixed a bad call to H2CHR that was causing COMB to bomb with OPCODE='SPIX'. Also added a trap for input maps at the same frequency when forming spectral-index maps.
Moved to 15JUL89 this date.

5041. *May 15, 1989* POSSM *Phil*

Was not closing files properly when plotting spectra from all IF's, also failed when plotting any IF other than the first.
Moved to 15JUL89 this date.

5042. *May 15, 1989* RECAT *Chris*

Fixed a number of problems:
(1) Revised offsets to the sequence number and file name (and the length of the catalog entry) to correspond with revision C of the CA file structure — the fact that these had changed was apparently missed in the code overhaul;
(2) Corrected a bad Fortran-77 substring expression that was overwriting the tail of the "Put *file* in slot *i*" message;
(3) Increased the size of the character transfer between the CB file and the corresponding record in the CA file so that type file is now transferred as well as the name and class;
(4) Changed an explicit offset to the file status to a symbolic value (previously set in a DATA statement but not used); and
(5) Removed two assignments to NCHAR in subroutine REBILD that merely added noise to the code.
Moved to 15JUL89 this date.

5043. *May 19, 1989* REQBAS *Chris*

A new utility routine to determine whether a given baseline is in the set selected by the user with the ANTENNAS and BASELINE adverbs.
Moved to 15JUL89 this date.

5044. *May 20, 1989* ZTXOP2 *Eric*

Changed the GEN and VMS versions to prevent writing over an old file except when APPEND is specified.
Moved to 15JUL89 24-May.

5045. *May 20, 1989* ZTRLOG *Eric*

Changed the VMS version to test the type of device when the translation loop fails. If it is disk, then no error is returned. If it is non-existent or not a disk, then an error is returned. If at least one translation does work, then no error is returned even if the last symbol is not a device or another logical. This allows the higher-level routines to find any deeper errors, but will let ZWHOMI work (translation of logical gives TV number and is not meant to be a device).
Moved to 15JUL89 24-May.

5046. *May 20, 1989* INQINT, INQFLT *Eric*

These free-format integer and floating read routines did not reset the buffer pointer when they had to read another line from the terminal. This made for an infinite loop. Corrected.
Moved to 15JUL89 24-May.

5047. *May 20, 1989* GRITP *Eric*

Corrected numerous overhaul mistakes. Added options to mount, position, and dismount the tape.
Moved to 15JUL89 24-May.

5048. *May 20, 1989* GR2TEX *Eric*

Overhauled AIPGVMS:GRTOTEX and renamed it AIPPGM:GR2TEX. Changed it to be much more *AIPS*-like, to use *AIPS* ZTX... routines, to offer the option of mounting and dismounting the tape, and corrected several minor errors. It still uses the logical (environment) variable TARGET. This routine will now convert an *AIPS* GRipe file into a text file suitable for e-mail to Charlottesville (see addresses on the masthead).
Moved to 15JUL89 24-May.

5049. *May 22, 1989* Service programs *Eric*

Changed service programs to use free format throughout. This required a new subroutine INQGEN to get a sequence of variables in a list of types for those few lines of input which mix types (*e.g.*, FILINI for file names, POPSGN). Changed AIPLAS, AIPMAN, DELSG, FILAIP, FILINI, FIXCAT, FIXUSR, POPSGN, RDFITS, SETPAR, and SETTVP. Also corrected some shaky logic at the end of line in INQINT and INQFLT free-format read subroutines. Corrected bad comment in GETSTR.
Moved to 15JUL89 24-May.

5050. *May 22, 1989* Number interactive AIPS *Eric*

We have been limiting the number of interactive AIPS to 6 if there are any batch queues. This was done to avoid interference in the Task Data file between AIPSC and tasks. Since we changed to QMNGR to run the batch queues, this has not really been necessary, so dropped the requirement. Now there can be up to 12 interactive AIPSes with 2 batch queues.

Changed AIPPGM: routines AIPSB, AIPSC, BATER, BSTRT1, FILAI2, FILAIP, FILINI, GRIPR, POPSGN, and QMNGR; AIPGUnix: routine ZSTRTB; AIPSUB: routines AU1, AU1A, AU2, AU2A, AUA, AUB, AUC, EDITOR, HELPS, INIT, OERROR, PREAD, PRTMSG, PSEUDO, SCHOLD, and VERBS; APLGEN: routine ZSETUP; APLVMS: routine ZSETUP; APLPGM: routines NOBAT and PRTAC; APLSUB: routines BATPRT, GTPARM, MSGWRT, RELPOP, and WHOAMI; and QFPS16: routine QINIT.

I doubt that computers are up to the potential load, however.

Moved to 15JUL89 24-May.

5051. *May 22, 1989* VMS *Eric*

Changed AIPS.COM to make TVDEV*n* a logical parameter rather than a symbol. Changed VMS version of ZTRLOG to allow for non-disk translations, if one level of translation does work.

Moved to 15JUL89 this date.

5052. *May 23, 1989* QUEUES *Eric*

Changed help file and AUB to have BATQUE=0 mean all queues for the listing verb.

Moved nowhere.

5053. *May 23, 1989* Pseudoverbs *Eric*

Changed POLISH to block some pseudoverbs from compiling outside of procedure-building mode. Changed the help files for IF, THEN, and WHILE to explain that they may be used only in procedures. Added a new error message to OERROR.

Moved to 15JUL89 this date.

5054. *May 23, 1989* *TESS programs *Tim*

A serious shortcoming of the *TESS routines has been fixed. Previously, the restoring beam was applied incorrectly for rectangular images. This only affected the IVTC images. The MAKGAU routine has now been changed to rectify this.

Moved nowhere

5055. *May 23, 1989* UVLOD *Eric*

Changed UVLOD and help file to provide a default of 50 for NPOINTS, rather than refuse to start UVLOD when NPOINTS = 0 for a FITS file, which does not use the parameter.

Moved to 15JUL89 this date.

5056. *May 23, 1989* FITTP *Eric*

FITTP was writing character data for keywords one column over from that recommended in the standard for the "fixed" format. It has been that way for years and no one has noticed and does not in fact violate the actual standard.

Moved to 15JUL89 this date.

5057. *May 24, 1989* FILLM *Bill C*

Major revision; changes include:

(1) Now FILLM can copy all the data for a given project/subarray to disk in a single pass.

(2) Output files are automatically expanded and contracted; the user no longer needs to specify the size of the output files. If the output disk fills up, FILLM should save the data already read and shut down gracefully.

(3) Optional appends to existing *AIPS* files are supported for reading multiple tapes.

(4) A reference day (REFDATE) adverb was added and can optionally be used to specify the desired reference day.

(5) BAND was expanded to 4 characters; the first two now specify the desired band for the A-C and B-D IFs.

(6) FILLM now gives more messages about sources, times and frequencies.

(7) Bandwidth is now used to specify a source number; a source number corresponds to a unique source name-qualifier-bandwidth.

(8) Several bugs were fixed which caused qualifier not to be correctly handled.

(9) FILLM now uses the LST times of the Modcomp scans to determine scan boundries.

(10) Also changed: FILLM.HLP, REFDATE.HLP, POPSDAT.HLP, INC:DAPL.INC.

Moved nowhere.

5058. *May 24, 1989* FQ Tables *Phil*

FQ tables introduced. These are similar to the old CH tables in that they contain information about the IF frequency offsets. However, they are more fundamental in that we have modified the *AIPS* database so that it is now able to hold more than one frequency/bandwidth (within limits). The use of the FQ tables is determined by the presence of a FRQSEL random parameter in the catalog header. If this is present, the programs assume that an FQ table is also present and will attempt to use it. Each FRQSEL value has a corresponding entry in the FQ table, so the tasks can just look in the table and obtain the frequency offset (from the reference frequency), the channel bandwidth, the total bandwidth and the sideband of the data.

Many tasks have been modifed (see list below) to deal with the new data format; most require some form of data selection through the three new adverbs SELBAND, SELFREQ and FREQID. Tasks will complain if they are not able to manage with the required adverbs.

Several subroutines have also been changed to deal with FQ tables. Most of the changes are invisible to the programmer. However, the following have had their call sequences modifed: CHNDAT, FRQTAB, CHNCOP, TABCAL, TABSN, TABBP, and TABNDX.

The new frequency selection parameter has also meant that some tables have had to be modified, namely the CL, SN, BP and NX tables. To faciltate the translation between the old type tables and new tables (needs a major modification because the number of columns has changed), I have written the following routines: CLREFM, SNREFM, and BPREFM. The NX modification is taken care of within TABNDX as it was a much simpler case. These routines will read and, if necessary, reformat the various tables, in a manner that is invisible to the user.

Other routines have been written to deal with the I/O to the FQ tables. FQINI and TABFQ are analagous to the similar routines that exist for all other tables. FQMATC determines if the selection criteria, *i.e.*, the new adverbs, match the FQ entries. This is used to detect any possible ambiguities through the selection of data using SELBAND and SELFREQ.

Moved nowhere.

5059. *May 24, 1989* FQ Tables *Phil*

Subroutines modified:

- BPASET — added call to BPREFM, added check of FRQSEL.
- BPINI — changed number of columns, be careful with reads/writes.
- CALADJ — added call to SNREFM.
- CALINI — changed number of columns, be careful with reads/writes.
- CALREF — changed number of columns, be careful with reads/writes?
- CHNCOP — added FREQID to call sequence.
- CHNDAT — added FREQID to call sequence; ensured would read old CH tables if they exist, but only ever write an FQ table.
- CLUPDA — added calls to SNREFM, CLREFM.
- CSLGET — modified equivalences,added check of FRQSEL.
- DATGET — check to see if reading correct FRQSEL entry from *uv* database.
- DGHEAD — remove FRQSEL random parameter in output CATBLK.
- FRQTAB — changed call sequence.
- GACSIN — changed number columns?
- GAININ — added calls to SNREFM, CLREFM.
- INDXIN — updated TABNDX call sequence.
- NDXINI — changed number of columns, be careful with reads/writes.
- SELINI — added SELBND, SELFRQ, FREQID defaults.
- SELSNG — modified equivalences, added calls to CLREFM, added check of FREQID.
- SN2CL — modified equivalences, added calls to SNREFM, CLREFM,added check of FREQID.
- SNAPP — same as above.
- SNINI — changed number of columns, be careful with reads/writes.
- SNSMO — same as SNAPP.
- TABBP — added FREQID to call sequence, be careful with pointers.
- TABCAL — same as above.
- TABSN — same as above.
- UVGET — checks for valid FRQSEL values.
- UVPGET — checks for location of FRQSEL in random parameter list.
- UVGRID — changed call sequence.
- UVNDIV — changed call sequence.
- UVNSUB — changed call sequence.
- UVTBGD — changed call sequence.
- MAKMAP — changed call sequence.

Moved nowhere.

5060. *May 24, 1989* FQ Tables *Phil*

Tasks and help files modified:

- ANCAL — added SELBAND, SELFREQ, FREQID adverbs; modified so will only correct relevant CL rows.
- BPASS — added SELBAND, SELFREQ, FREQID adverbs; changed several call sequences.
- CALIB — added SELBAND, SELFREQ and FREQID adverbs.
- CLCAL — added SELBAND, SELFREQ, FREQID adverbs.
- CLCOR — added SELBAND, SELFREQ, FREQID adverbs; modified to deal with new format tables.
- FILLM — added ability to write FQ entries; this is now the default action. CH tables will no longer be written.
- GETJY — added SELBAND, SELFREQ, FREQID adverbs, so will only use requested SN entries while determining flux densities.
- HORUS — added SELBAND, SELFREQ, FREQID adverbs.
- INDXR — will index on FQ entries as well as source changes, time gaps, etc.
- LISTR — added SELBAND, SELFREQ and FREQID adverbs for data selection. Made scan summary more comprehensive; will list frequency id index, along with a summary of the FQ table.
- MULTI — modified so that will write FRQSEL random parameter as well as the source random parameter.
- POSSM — added SELBAND, SELFREQ and FREQID adverbs; also modified the BP plotting section to read the FREQID set by the user.
- PCAL — added SELBAND, SELFREQ, FREQID adverbs.
- SETJY — added FREQID adverb — needed for velocity calculations; program only complains if is not set but it needs it.
- SNPLT — added SELBAND. SELFREQ, FREQID adverbs, only used if relevant.
- SPLIT — added SELBAND, SELFREQ, FREQID adverbs, will split data ensuring that output files have one FREQID random parameter only (actually DGHEAD ensures that).
- TVFLG — added SELBAND, SELFREQ, FREQID adverbs.

Moved nowhere.

5061. *May 24, 1989* FQ Tables *Phil*

Tasks and help files modified:

- UVFIT — added SELBAND, SELFREQ, FREQID adverbs
- UVIMG — added SELBAND, SELFREQ, FREQID adverbs.
- UVMOD — changed CHNDAT call sequence.
- UVPLT — added SELBAND, SELFREQ, FREQID adverbs.
- VBPLT — changed CHNDAT call sequence.
- VLBIN — changed several call sequences. I wonder if this one needs to write FQ tables??
- MX — changed call sequences.
- ASCAL — changed call sequences.
- UVSUB — changed call sequences.
- VSCAL — changed call sequences.

Moved nowhere.

5062. *May 24, 1989* FQ Tables *Phil*

Also changed a number of tasks to initialize the frequency selection and other new parameters in the commons. These were CVEL, CSCOR, GRIDR, SDCAL, SDTUV, PRTSD, and SELSD.
Moved nowhere.

5063. *May 24, 1989* SNPLT *Phil*

Modifed slightly so that when plotting constant values they appear in the middle of the frame, not at the bottom.
Moved nowhere.

5064. *May 25, 1989* UVPLT *Phil*

Fixed bug that was causing the filename to be missing from the plot. Also the last two letters of the STOKES label were missing — of course, I tested that with RR, not FULL. Made the Stokes labelling a little more intelligent.
Moved to 15JUL89 this date.

5065. *May 25, 1989* GREYS, QMSPL, TKPL *Eric*

Corrected TKPL — the call to initialize the TK image catalog was zeroing the catalog header. Changed the variable name. Altered QMSPL to force pixels to be square when the axis increments and XYRATIO parameters allow that. Corrected GREYS — the attempt to avoid opening the same file twice caused it to contour and grey-scale the same plane whenever the second image's name parameters were fully specified.
Moved to 15JUL89 this date.

5066. *May 28, 1989* FILLM *Phil*

Added the ability to define user's own frequency tolerance in the assigning of FQ numbers.
Moved nowhere.

5067. *May 28, 1989* POSSM *Phil*

Removed an errant MSGSUP setting and made handling of STOKES labelling on the plots a little more intelligent. Also increased the size of the crosses for the phase plots.
Moved nowhere.

5068. *May 28, 1989* CLREFM, SNREFM, BPREFM *Phil*

The reformatting routines were not dealing properly with the simple case of a single-polarization table. Also corrected an error in changing the read/write status of the files whose tables were being modified.
Moved nowhere.

5069. *May 28, 1989* BPINI *Phil*

Had wrong number of columns in single-polarization case.
Moved nowhere.

5070. *May 27-29, 1989* TV *Eric*

Changed:

- AU5A — Corrected real = hollerith statement.
- ZVTVX3 — APL4PT2 version: corrected reference to number of data words to read and made it more machine independent.
- ITICS — Corrected the order of statements: a tick label could be placed at an arbitrary location before if the inside end of the tick actually fell outside the image (*i.e.*, in the presence of rotation). Changed it to make tick marks of the same length, more or less, on all TV plots.
- IAXIS1 — Extended blanking of graphics one more pixel in all directions. Wedge labels were not being fully erased.
- HDRBUF — Corrected it to handle the tranfer function as the 2 characters it is. Routine was doing it as integer and, hence, losing all the relevant information.

Moved to 15JUL89 this date.

5071. *May 29, 1989* IVAS *Eric*

For some reason, the IIS subroutine FIVASMOUSESTATUS (yes, that's its name) is now returning arbitrary error codes. Before it returned either 0 or the Y position only, but now values in the range -21760 to -22016 arise fairly arbitrarily. Added code to ignore these error levels. Changed IVAS versions of YBUTON and YCRCTL.
Moved to 15JUL89 this date.

5072. *May 29, 1989* IMHEADER, QIIEADER *Eric*

Corrected both to use ITRIM rather than TRIM in displaying the random parameters. Before the fix, the routine dropped the intended indentation. Changed LSTHDR and KWIKHD.
Moved to 15JUL89 this date.

5073. *May 29, 1989* SPLIT *Phil*

Ensured that a duplicate copy of the FQ table was not made by putting it into the list for ALLTAB exclusion.
Moved nowhere.

5074. *May 30, 1989* TABSN, TABCAL, TABBP *Phil*

An error was being made in determining the number of columns; I had forgotten to deal with the simple case of a single polarization.
Moved nowhere.

5075. *May 30, 1989* CHNDAT *Phil*

Had lost the ability to deal with data with no IF axis in catalogue header due to a GO TO with wrong statement number.
Moved nowhere.

5076. *May 31, 1989* ZI8IL *Eric/Bill C*

Corrected ZGETCH and ZPUTCH in APLUnix: to force 8-bit integers to be unsigned. Under Unix C, char variables are signed (2's complement) integers.
Moved to 15JUL89 this date.

5077. *May 31, 1989* TV LUTs and OFMs *Eric*

Corrected routines handling the LUT and OFM of the TV. The computations of these were not the same everywhere, especially for the IVAS where MAXINT is 8 times greater than LUTOUT. Changed were AU6, AU6A, GRLUTS, TVMOVI, YINIT (YM75), YINIT (YIVAS), YINIT (YSSS), TVFLG, and TVFIDL. Also corrected TVMOVI to use variables rather than constants in the calls to turn on and move the cursor. The constants were illegal since the arguments are in/out type; apparently the YIVAS version is different than the YM70 version in its handling of them.
Moved to 15JUL89 this date.

5078. *May 31, 1989* FILINI *Eric*

A branch was missing which caused an INIT on the PW file to init also the TC file. Fixed.
Moved to 15JUL89 this date.

5079. *May 31, 1989* TVFLG *Eric*

Changed to use free format when reading numbers from the user.
Moved changes to 15JUL89 sometime.

5080. *May 31, 1989* Convex *Chris*

Brought option files up-to-date. Affected were ASOPTS.SH, CCOPTS.SH, FCOPTS.SH, LDOPTS.SH, and PP..
Moved to 15JUL89 this date.

5081. *June 1, 1989* DATCAL *Bill C*

Fixed problem with delay corrections when a subset of channels was being calibrated or when multiple IFs were present. The phases were wrong by $-2\pi \times$ delay-correction $\times$ frequency-offset. This should have had little effect in the past since, normally, all frequency channels were calibrated together and CALIB could not correctly fringe fit multi-IF data. This is the routine which applies amplitude, phase, delay and rate corrections.
Moved nowhere.

5082. *June 1, 1989* CALIB *Bill C*

Fixed numerous bugs causing fringe fitting of multi-IF data to fail. General changes were: the delays are now done with respect to the reference frequency rather than the first channel; checks for valid data are now made per IF; several call sequences were fixed which formerly caused trouble when multiple-IF data was being fringe fitted. None of these should have caused trouble for single-IF fringe fitting or have affected amplitude and/or phase solutions.
Moved nowhere.

5083. *June 1, 1989* MK3IN *Bill C*

This task isn't finished yet, but might possibly work under simple circumstances. It reads raw correlator MKIII VLBI data from Haystack format "A" tapes and converts them to an astronomically useful time system. The correlator model is recomputed on an antenna basis and written in the CL table. Also MK3IN.HLP.
Moved nowhere.

5084. *June 1, 1989* APLGEN:ZDIIPRL, ZRHPRL *Bill C*

New routines to convert Hewlett-Packard floating format to local double- or single-precision used by MK3IN to read HP backup tapes. These versions should work on any machine.
Moved nowhere.

5085. *June 1, 1989* BPINI *Phil*

Bug in computing column number for IF freqs in table. Introduced with FQ tables.
Moved nowhere.

5086. *June 1, 1989* BPASET *Phil*

Was not closing down BP table properly — wrong call sequence to TABBP.
Moved nowhere.

5087. *June 1, 1989* UVGET *Phil*

Tracked down the persistent problem of tasks complaining that they couldn't find weight and scale for compressed data, but running the same task immediately afterwards worked. This was because GAININ sorted CL tables and modified the catalog header, but on the second attempt, it did not sort the table so had no problem. All of this was caused by AIXFND being passed CATBLK instead of CATUV.
Moved to 15JUL89 this date.

5088. *June 1, 1989* — BPASS — *Phil*

Modified divide by channel 0 option so that the channels used to generate channel 0 are the same as Ken Sowinski uses on the Modcomp.
Moved to 15JUL89 this date.

5089. *June 1, 1989* — SETJY — *Phil*

Added adverb OPTYPE to help file, when OPTYPE='CALC' and SOURCE = '3C286' or '3C48' the task will use the Baars *et al.* formulae to calculate the flux densities and insert them into the SU table.
Moved nowhere.

5090. *June 1, 1989* — HORUS — *Phil*

Was copying the FQ table to the output map. Fixed.
Moved nowhere.

5091. *June 2, 1989* — MX — *Phil*

Bombed on compressed data due to an incorrect call sequence to CMPARM.
Moved to 15JUL89 this date.

5092. *June 2, 1989* — TVFLG, DTVF.INC — *Phil*

Fixed bug in routine TBTIME which was causing the stop time of the selected data to be set incorrectly when reading MX tables. Also the byte offset to UVINIT was wrong for single-source files when writing the flagged data. Also added the three new FQ adverbs to DTVF.INC.
Moved to 15JUL89 this date.

5093. *June 2, 1989* — CLREFM, SNREFM, BPREFM — *Phil*

These routines need two LUN's when reformatting tables which were being passed in the call sequence from upper-level routines. However this was causing problems, since I had to guess which were unused at the time. Removed the 2nd LUN from the call sequence and hard-wired it in as 45; this LUN is released by the end of the routine. Had to modify AMCAL, CLCOR, SNPLT, CLUPDA, GAININ, SELSMG, GETJY, CALADJ, SNAPP, SNSMO, SN2CL and BPASET as these all called the reformatting routines.
Moved nowhere.

5094. *June 2, 1989* — Bytes — *Eric*

An "*AIPS* byte" is now 16 bits on most machines, one-half of a local integer. Error messages in ZCREAT and ZMIO (generic) were causing user confusion by referring to these entities as bytes. Changed ZMIO to display 8-bit bytes explicitly and dropped bytes from the ZCREAT message.
Moved to 15JUL89 this date.

5095. *June 2, 1989* — Convex tapes — *Eric*

A long-standing difficulty with opening tapes on the Convex has turned out to be due in part to an assumption that the tape was positioned after an end of file record rather than, possibly, being after a data record. Changed APLCVEX:ZTPOPN to test on the initial back-record for the latter possibility and advance-record, rather than advance-file, when that occurs.
Moved to 15JUL89 this date.

5096. *June 3, 1989* — LISTR — *Bill C*

Fixed call argument to NDXINI, changed literal "1" to a variable. This seems to have caused trouble when an index table was not present.
Moved to 15JUL89 this date.

5097. *June 4, 1989* — TV labeling — *Eric*

Changed ITICS and IAXIS1 to label wedges on the *x*-axis only and to remove errors in the previous "fixes" to ITICS. TICINC must be called with correct corners. Then the tick lengths can be set using the TV size.
Moved to the Convex and SUNs (15OCT89) and to 15JUL89 this date.

5098. *June 4, 1989* — IVAS cursor — *Eric*

In an attempt to appease the IIS gods, I changed YCRCTL and YBUTON in YIVAS to set an error return when FIVAS-MOUSESTATUS returns error codes other than expected, but not to call YDOERR. The latter has never worked right and most of the cursor status errors are not serious enough to cause the program to collapse.
Moved to 15JUL89 this date.

5099. *June 5, 1989* CLUPDA *Phil*
Removed an extraneous message suppression.
Moved nowhere.

5100. *June 5, 1989* SN2CL *Phil*
Removed a call to CLREFM which was trying to reformat a table not yet created, and fixed the logic handling FREQID values being read from tables.
Moved nowhere.

5101. *June 5, 1989* DATBND *Phil*
Inserted a check which flags data when the bandpass is zero, which occasionally happens for the last channel.
Moved nowhere.

5102. *June 5, 1989* IIS Model 75 *Eric*
Overhauled the 19 subroutines in YM75. Moved YOFM and YGRAPH to YIIS, dropping the YM70 version. The two versions of YOFM became similar when we switched to a proper description of the OFM intensities. The latter was always similar, but IIS pretended to have 512 levels with the Model 75, when they did not use them. We can't test these yet since we don't have an IIS Model 75.
Moved to 15JUL89 this date.

5103. *June 5, 1989* Convex *Chris*
Moved SPACE. and SPACE.FOR to CVax, representing the programs currently used to show disk hogs on CHOLLA.
Moved to 15JUL89 this date.

5104. *June 6, 1989* DGHEAD *Phil*
Ensured that the catalogue header holds the correct frequency when a frequency id number is specified.
Moved nowhere.

5105. *June 6, 1989* SPLIT *Phil*
Ensured that the catalogue header and IF offsets are correct when a frequency id number is present.
Moved nowhere.

5106. *June 6, 1989* SPLIT *Phil*
Corrected a problem that occurred when compressed data were being written. The correct number of random parameters was not being used when the output file was created, so when the *uv* file was over a certain size, the size of the output file was too small.
Moved to 15JUL89 this date.

5107. *June 6, 1989* GR2TEX *Eric*
Added GR2TEX to include files DSAT and VSAT. Then recompiled ZTTOPN and relinked GR2TEX. Every stand-alone program needs to be listed in this file.
Moved to 15JUL89 this date.

5108. *June 6, 1989* DeAnza *Eric*
Overhauled the DeAnza Y-routines. Changed ZDEAXF (generic) to call ZIPACK to convert the TV buffer to and from 16-bit form. Also dropped the Retrographic versions of ZTKOPN and ZTKCLS from YDEA and moved overhauled versions of these to APLGEN under the names ZTKOPN.RTG and ZTKCLS.RTG.
Moved to 15JUL89 this date.

5109. *June 7, 1989* SETJY *Phil*
Added 3 more OPTYPE options for resetting fluxes and velocities. This is less clumsy than having to set the respective adverbs to 10^{-10}. Also modifed the help file.
Moved nowhere.

5110. *June 7, 1989* BPASS *Phil*
BPASS was not checking the frequency id correctly in the indexing stage inside subroutine BASOLV.
Moved nowhere.

5111. *June 8, 1989* DATGET *Phil*
Added check on frequency id when reading NX table; I had missed this one because it used TABIO directly instead of TABNDX.
Moved nowhere.

5112. *June 8, 1989* VISCNT *Phil*
Added some more comments; repaired spelling.
Moved nowhere.

5113. *June 8, 1989* CALIB *Bill C*
Put a trap in CLBSRC to keep it from blowing up if it was asked to fringe fit an IF which had no valid data.
Moved nowhere.

5114. *June 8, 1989* MK3IN *Bill C*
Removed retarded correlator correction after phone conversation with Alan Rogers which indicated that it was already done in the correlator. Also cleaned up the logic dealing with line data and multiple (parallel hand) polarizations. It may work now for simple continuum or line data, but has not been throughly tested.
Moved nowhere.

5115. *June 8, 1989* Helps *Eric*
Added copyright information and lines for documentation to all help files (bypassing the chkout system). Changed AU1A, AU2, AU2A, AIPSC, GRIPR, and BATER to skip the precursor comment lines — all have a semicolon in line 1. Changed all A*.HLP to fill in the documentation lines.
Moved to 15JUL89 this date.

5116. *June 9, 1989* UVINIT *Bill C*
Allowed use of single buffering when NPIO passed was 0. This was causing some routines to declare falsely that the buffer was too small. Also removed the last traces of tape I/O with UVINIT.
Moved nowhere.

5117. *June 9, 1989* POSSM *Phil*
Fixed up the scaling/labelling on the ordinate. The time of a bad bandpass scan was not being formatted correctly; fixed that.
Moved nowhere.

5118. *June 9, 1989* UVLOD *Phil*
Fixed up handling of BAND and a typo.
Moved nowhere.

5119. *June 12, 1989* BPASET *Phil*
A problem with equivalences which was screwing up the 2nd IF. Redeclared the BREAL and BIMAG arrays to their full sizes and it went away.
Moved to 15JUL89 this date.

5120. *June 12, 1989* VLBIN *Phil*
When FQ tables were introduced, I removed the line defining the number of IF's in the data — put it back.
Moved nowhere.

5121. *June 12, 1989* CATKEY *Eric*
Corrected bug causing keyword values to fail to get into the extended image header. Most visible so far with RESCALE.
Moved to 15JUL89 this date.

5122. *June 12, 1989* Histograms *Eric*
Changed YRHIST for YH70 and YH75 to account correctly for the fact that 2 16-bit words are returned for each value.
Moved to 15JUL89 this date and from the Convex.

5123. *June 25, 1989* B*.HLP *Eric*
Filled in documentation lines in the B*.HLP files.
Moved this date to 15JUL89.

5124. *June 13, 1989* GAININ *Phil*
Made error messages more informative.
Moved nowhere.

5125. *June 13, 1989* UVPLT *Phil*

Dies a little more elegantly now.
Moved to 15JUL89 this date.

5126. *June 13, 1989* Plot files *Eric*

In the past, the number of adverb locations for a plot program was limited to 246 — at least as saved in the plot file header. Changed GINIT to write a second, third, or fourth record as needed to hold all the parameters. Changed CANPL, LWPLA, PRTPL, QMSPL, TKPL, TVPL, and TXPL to skip over the parameters if they move to additional records. Changed SNPLT and POSSM to have their own plot types (17 and 16, resp.). Corrected number of parameters in UVPLT.
Moved to 15JUL89 this date.

5127. *June 13, 1989* POPSGN *Eric*

Improved the message prompting for inputs since they are now in free format and the old input line will not work.
Moved to 15JUL89 this date.

5128. *June 14, 1989* SETSTK *Phil*

New subroutine to ensure that the STOKES adverb requested by the user is a valid one for the plotting routines; if it is not, it is changed.
Moved to 15JUL89 this date.

5129. *June 14, 1989* UVPLT, POSSM, TVFLG *Phil*

Modified to call SETSTK. This corrects the problem we were encountering due to lax description of STOKES and a misunderstanding of what UVGET returned.
Moved to 15JUL89 this date.

5130. *June 14, 1989* BPASS *Phil*

Modified an informative message to the user which was incorrect.
Moved to 15JUL89 this date.

5131. *June 14, 1989* Plot programs *Eric*

Changed CNTR, PCNTR, GREYS, and PROFL to test and set the star-plotting adverbs before the calls to GINIT. This allows EXTLIST to tell users about their having plotted star positions. Changed SL2PL to correct errors in the overhaul in which REALs had their values integerized incorrectly in the special "extra-information" plot record.
Moved to 15JUL89 this date.

5132. *June 14, 1989* TV *Eric*

Changed YIVAS versions of YCRCTL and YBUTON yet again. The IVAS has come up with more meaningless error numbers from FIVASMOUSESTATUS. What will happen if there is ever a real one? Also changed an error in the YIIS version of YGRAPH. The graphics images were left as ghosts when the graphics planes were turned off.
Moved to 15JUL89 this date.

5133. *June 15, 1989* TABNDX *Phil*

Minor mod to ensure that, if no FQ column present in NX table, then a sensible value is always returned.
Moved nowhere.

5134. *June 16, 1989* SETSTK *Phil*

In the case where DOCALIB=1 and NCOR=1, routine was setting STOKES to I instead of RR or LL.
Moved to 15JUL89 this date.

5135. *June 16, 1989* POSSM *Phil*

When the last channel of a spectrum was flagged, the weights accumulated during the averaging were set to zero, so the normalization of the averaged spectrum was not done. Fixed. Also ensured that the scaling relevant to the IF being plotted was passed to GINIT for recording by EXTLIST.
Moved to 15JUL89 this date.

5136. *June 16, 1989* PRTUV *Phil*

The error message about PRTUV not being able to handle compressed data was not being printed.
Moved to 15JUL89 this date.

5137. *June 16, 1989* — ZVLBIN, VLBIN — *Phil*

There was a problem with reading the data from the external file involving 2-byte integers. Fixed.
Moved to 15JUL89 this date.

5138. *June 18, 1989* — BPASS — *Phil*

Fixed a small problem when running task on data without an FQ entry; it was still checking for one.
Moved nowhere.

5139. *June 19, 1989* — PUVD — *Eric*

Changed maximum baseline number to allow for autocorrelations.
Moved to 15JUL89 23-June.

5140. *June 20, 1989* — UVPLT — *Phil*

Corrected spelling of 'Amplitude' in label.
Moved nowhere.

5141. *June 20, 1989* — VLBIN — *Phil*

Was not flushing compressed data with the correct buffer, also wrote a corrupted last record when hit visibility limit.
Moved to 15JUL89 this date.

5142. *June 20, 1989* — SNPLT — *Phil*

Was not dealing with the Stokes adverb correctly: the user had to specify 'R ' exactly to get what was wanted.
Changed to key on first letter.
Moved to 15JUL89 this date.

5143. *June 20, 1989* — FITTP — *Phil*

Modified to deal with FQ tables. If task finds file with an FQ table with > 1 row, it writes them to tape with warning that only 15OCT89 *AIPS* can deal with this data. If there is only one row, the FQ table is translated to a CH table so older *AIPS* can read it. Also modified FITTP.HLP.
Moved nowhere.

5144. *June 20, 1989* — UVMAP — *Chris*

Removed quotes from the UV argument in a call to QGRIDA. This was causing UVMAP to crash when a zero-spacing flux was given. The bad call was probably introduced in the code overhaul.
Moved to 15JUL89 this date.

5145. *June 20, 1989* — VTESS and UTESS — *Chris*

Altered VTESS and UTESS to update the maximum and minimum values in the output maps under all circumstances. Previously, the maximum was only updated if it increased and the minimum was only updated if it decreased.
Moved to 15JUL89 this date.

5146. *June 21, 1989* — UVPLT — *Chris*

Recoded the handling of the ANTENNAS and BASELINE parameters. UVPLT was treating the BASELINE input array as an extension of the ANTENNAS input array. This meant that data from baselines between elements of the BASELINE array were, incorrectly, being plotted (or excluded from the plot if an element of ANTENNAS was negative).
Moved to 15JUL89 this date.

5147. *June 21, 1989* — EXTLIST, Plot programs — *Eric*

Changed AU8A, cleaning up the displays, bringing UVPLT and others up to the current sets of inputs, and adding SNPLT and POSSM. Changed VBPLT, GAPLT, and SNPLT to display the antennas or antenna pairs actually used on the specific plot in the inputs stored with the plot file. Fixed logic in AN1ORS and VBPLT to select the advertised set(s) of antennas or antenna pairs. Dropped INTYPE from EXTLIST — changed the help file and AU8A.
Moved fixes to 15JUL89 this date.

5148. *June 22, 1989* — Unix Z routines — *Eric*

Changed SYSAIPS and SYSUnix versions of AREAS.DAT to delete all references to COS and ModComp (MC4) and to change the Unix Z directory structure. The BELL area will now refer to System V with subdirectories for Mascomp and Cray. The BERK area will now refer to bsd 4.2 and later with subdirectories for Alliant, Sun, Vax, and Convex. The last will have subdirectories for NRAO1 and VLAC1. Appropriate code movements and deletions were done on all NRAO computers. Note that we have now deleted all references to Bell versions 3 and 7 and Berkeley 4.1.
Moved to 15JUL89 this date and to all NRAO computers.

5149. *June 23, 1989* GREYS *Chris*

Added a missing argument, IERR, to the call to SLICPL. Also added code to handle a non-zero value of IERR on return from SLICPL. The missing argument caused a bus error under Unix when attempting to overlay a slice.
Moved to 15JUL89 this date.

5150. *June 23, 1989* Overhaul Z areas *Eric*

In APLVax (the new Vax-Unix area), deleted obsolete ZDCHIN, ZR32RL, and ZRLR32, added ZDCHI2, and revised ZTAP2.C. In APLALLN (the renamed Alliant area), deleted obsolete ZDCHIN, ZR32RL, ZRLR32, ZR64RL, ZRLR64, ZTTYIO, ZTTOPN, ZXCLOG, ZXTLOG, and ZXTSPY, added ZDCHI2, revised ZTPWAD and ZTAP2.C, and revised and renamed ZMOUN2.C to ZMOUNT.TMOUNT (since it used tmount which may be Jilla-specific). Changed APLUnix version of ZTTOPN to have a somewhat cleaner structure and to do better error recovery.
Moved to 15JUL89 this date.

5151. *June 25, 1989* BELL Z routines *Eric*

Overhauled the Bell routines. In APLBELL, overhauled ZLOCK.C, ZTACT2.C, ZTKILL.C, and ZTQSP2.C and added ZDCHI2. In APLMASC, overhauled ZFRE2.C, ZMOUN2.C, and ZTAP2.C, and deleted ZR32RL, ZRLR32, ZR64RL, ZRLR64, ZTTYIO, and ZXTSPY.C. Tried a guess on the Masscomp format of df which may have to be fixed up in ZFRE2.C.
Moved to 15JUL89 this date.

5152. *June 25, 1989* C*.HLP *Eric*

Filled in documentation lines in the C*.HLP files. Also changed SCALR3 to CUTOFF as was intended long ago in SDCLN.HLP.
Moved this date to 15JUL89.

5153. *June 26, 1989* VMS Midnight Job *Eric*

Changed in UPDVMS:, the COM files:

JOBMAIN	—	Changed to call REPORT for each version.
REPORT	—	Changed to report each version separately.
VERSION	—	Changed to append to the same log file through as many loops as are required.
CLEANUP	—	Added creation of LASTGOOD.TMP, clarified purging commands.
CONTROL	—	Changed calls to SRTUNQ to specify LAST*xxxx*.DAT name.
SRTUNQ	—	Changed to use 2nd argument to give file of last good date. In this way, we can have separate last good dates for remove, copy, comrpl, and comlnk operations.
REMOVE	—	Changed to create LASTREMOVE.UPD when ends.
COPY	—	Changed to create LASTCOPY.UPD when ends happily.
COMUPD	—	New name for COMLNK.COM. Changed to create LASTCOMRPL.UPD when compile-replaces complete successfully and to create LASTCOMLNK.UPD when the compile-link error count is zero. Also changed to make link errors give an error exit after trying all links.
END	—	Change to make a LASTGOOD.DAT only if argument is 'OKAY'.

Also changed UPDVLA: versions of JOBMAIN, REPORT, and VERSION and removed COMLNK. Changed the list of people to whom to report failures given in PEOPLE.DIS.
Moved to 15JUL89 this date. Must go by hand to Vax1 before next midnight job.

5154. *June 29, 1989* BAKTP, BAKLD *Eric*

Overhauled BAKTP and BAKLD and moved them from APGVMS: to APGNOT:. Changed VMS versions ZSHCMD (correct process name, test for warning, bot okay, error codes), ZBKTP1, ZBKTP2, and ZBKTP3 (drop unused arguments in calls, correct DCL commands, dropping excess blanks), and ZBKLD1 and ZBKLD2 (drop excess "]" from DCL command, specify /NOLOG where appropriate). Changed DBKL.INC (declare some things CHARACTER instead of REAL, correct typing, drop DOCRT) and DBTP.INC (correct handling of CHARACTER). Changed BAKLD.HLP, dropping DOCRT pretense. Also changed APLGEN: and APLUnix: versions of ZBKTP1, ZBKTP2, and ZBKTP3 for the changed call sequence.
Moved to 15JUL89 this date.

5155. *June 30, 1989* ZACTV8 *Eric*

Corrected message giving area from which the load module will be executed. It was using a now-uninitialized variable for a not-meaningful message, so dropped the message except for pseudo-AP usage. Changed both APLVMS: and APLUnix: versions.
Moved to 15JUL89 this date.

5156. *July 3, 1989* — LIBR.DAT — *Eric*

The link of BAKTP failed on Convexes due to needing to search APLSUB followed by APLCVEX after the first APLCVEX. The files on NRAO1 and VLAC1 in the $SYSLOCAL areas did not match those on CVax for these machines. Corrected the CVax version — which was more or less okay for APGNOT anyway, but lacked the upgrade to IEEE for the Ivas link library.
Moved to 15JUL89 and forced a midnight job with a corrected (older) date.

5157. *July 3, 1989* — Help files — *Eric*

Deleted test help file DUMMY. Added category and one-line descriptions to all 53 D*.HLP files.
Moved from 15JUL89 this date.

5158. *July 3, 1989* — XTRAN — *Chris*

Added INFILE to common block /CHRCOM/ in local include XTRAN.INC. This prevents XTRAN forgetting the name of its input file.
Moved to 15JUL89 this date.

5159. *July 4, 1989* — UVFND — *Chris*

The section of code that prints out data meeting the selection criteria has been modified to take the requested IF into account. UVFND previously printed the amplitudes and phases for IF 1, no matter which IF was used in the search. This caused some confusion when OPCODE was set to 'CLIP' since the amplitudes printed were not always outside the flux range set in the APARM array.
Moved to 15JUL89 this date.

5160. *July 5, 1989* — BAKTP — *Eric*

Corrected BAKTP and APLUnix: version of ZBKTP1 to remove residual references to an old variable name in a new guise. It took the SUN compiler to spot this one.
Moved to 15JUL89 this date.

5161. *July 5, 1989* — SSS — *Eric*

Corrected YSSS: version of YSCROL to remove a typo that caused it not to send any commands to the SUN Screen Server. Corrected YSVU: version of SCRWRT.C to rewrite the screen with something in all cases and to recognize when all grey channels are off, but the graphics on. Also changed addressing when screen quadrants are written — now it works.
Moved from 15OCT89 on SAIPS this date.

5162. *July 5, 1989* — Calls to YSCROL — *Chris*

Fixed a number of calls to YSCROL in AU5A, AU5D, AU6, GRBOXS and GRPOLY that were using literal values for the SCROLX and SCROLY arguments (SCROLX and SCROLY are assigned to within YSCROL). The bad calls must have been introduced in the code overhaul.
Moved to 15JUL89 this date.

5163. *July 6, 1989* — INDXR — *Phil*

Added the ability to create a default CL table to INDXR. This is useful if for some reason the multi-source file you have created has no CL tables associated with it. Also modified INDXR.HLP.
Moved nowhere.

5164. *July 6, 1989* — CHANSEL — *Phil/Eric*

Changed DAPL.INC and POPSDAT.HLP to add adverb CHANSEL. Created new file CHANSEL.HLP to describe adverb selecting ranges of channel numbers.
Moved nowhere.

5165. *July 6, 1989* — Helps — *Eric*

Added categories and one-liners to 16 E*.HLP, 15 F*.HLP, and 35 G*.HLP. Also fixed up precursors in helps for APGS, BPASS, CALIB, CONVL, and FFT (all AP tasks).
Moved to 15JUL89 this date.

5166. *July 7, 1989* — QUACK — *Bill C*

New task. Allows flagging a specified portion of a selected set of scans defined in the NX table. The user can specify either the amount of bad data at the start of the scan or the amount of good data at the end of the scan selecting by source and/or timerange. This task is useful for systematically flagging data due to the instrument taking a while to settle down or when data taken while the antennas are still slewing is not properly flagged. Also added a QUACK.HLP.
Moved from Australia, nowhere else.

5167. *July 7, 1989* — CHANSEL.HLP — *Phil*

New adverb to select spectral channels in a more general way. It is specifically designed for the averaging together of up to 10 ranges of channels, each of which is defined by a start, stop, and increment of channel number. Updated POPSDAT.HLP, DAPL.INC, NEWPARMS.001 also.
Moved from Australia, nowhere else.

5168. *July 7, 1989* — WANTCH — *Phil*

New subroutine to determine if a channel is wanted based on the CHANSEL adverb. If it is not wanted, the weight is returned as 0.0
Moved from Australia, nowhere else

5169. *July 7, 1989* — AVGCHN — *Phil*

General routine to average a spectrum in frequency — channels are included/excluded based on the CHANSEL adverb.
Moved from Australia, nowhere else.

5170. *July 7, 1989* — SPLIT — *Phil*

Modified SPLIT so that it now uses the two new routines above when averaging in frequency. Also changed the help file.
Moved from Australia, nowhere else.

5171. *July 7, 1989* — KNTR — *M. Calabretta/Bill C*

Task imported from the Australia Telescope. Similar to CNTR except it plots multiple spectral channels on the same plot in a manner similar to KONTR and uses a contouring algorithm suitable for pen plotters. Also KNTR.HLP.
Moved from Australia, to 15JUL89 this date.

5172. *July 10, 1989* — UVHGM — *M. Calabretta/Bill C*

New task imported from the Australia Telescope. It makes plots of the statistics of values in a uv data file. Also UVHGM.HLP.
Moved from Australia to 15JUL89 and 15OCT89.

5173. *July 10, 1989* — FETCH — *AT/Bill C*

New task. Reads a text file containing an image in one of a variety of formats. Information about the image is read from a set of keyword-value pairs at the beginning of the file. This task was adapted from an Australia Telescope routine. This is a simple way to key image-like data into *AIPS*. Also FETCH.HLP.
Moved from Australia to 15JUL89 and 15OCT89.

5174. *July 10, 1989* — AVGCHN — *Phil*

Added BCHAN and ECHAN variables to the call sequence, and modified the routine slightly so that it would select on these as well. Also modified the defaults in the CHNSEL array — if the start and stop channels are zero these are reset to 1 and number of channels. This avoids a problem in WANTCH.
Moved from Australia to 15OCT89.

5175. *July 10, 1989* — SPLIT — *Phil*

The call sequence to AVGCHN had changed — fixed.
Moved from Australia to 15OCT89.

5176. *July 10, 1989* — Helps — *Eric*

Added one-liner descriptions and categories to 3 H*.HLP, 52 I*.HLP, 5 J*.HLP, and 4 K*.HLP files. Dropped JAFPL.HLP and IMOFF.HLP since they are obsolete.
Moved to 15JUL89 this date.

5177. *July 10, 1989* — TVHUEINT — *Eric*

Corrected bad call to YSLECT in AU6 and a bad common name in HILUT which prevented TVHUEINT from working after the overhaul.
Moved to 15JUL89 this date.

5178. *July 11, 1989* — WHATSNEW — *Eric*

Recreated this listing of changes to *AIPS* of general user interest. Listed all new things in overhaul plus highlights from the previous year or so.
Moved to 15OCT89 with additions, nowhere else.

5179. *July 11, 1989* SPLIT *Eric*

Corrected illegal Fortran constructs in which an INTEGER variable was used in a context requiring a LOGICAL. The VMS compiler did not complain about this despite using various "standard" switches. Also corrected handling of CHANSEL inputs — the numbers must be non-negative. Also corrected handling of CHNSEL in AVGCHN which set defaults to cause averaging of all channels even if only one of the 10 ranges was zero, and simplified the averaging code in SPLIT.
Moved to Australia this date, nowhere else.

5180. *July 11, 1989* GETCTL *M. Calebretta/Bill C*

Fixed bug in logic which caused it to fail when processing R or L polarization data. This fix should allow MX to clean R or L polarization data. Relinked MX, UVSUB, CALIB, and ASCAL.
Moved from Australia to 15JUL89 and 15OCT89.

5181. *July 12, 1989* AVSPC *Phil*

New task; will average spectral-line data in the frequency domain producing a pseudo-continuum dataset. It will copy (and modify if necessary) all associated tables and can handle compressed data. Also created a new help file.
Moved from Australia, nowhere else.

5182. *July 12, 1989* WHATSNEW *Eric*

Reordered and reworded some to make better emphasis. Also added AVSPC.
Moved appropriate changes to 15JUL89, nowhere else.

5183. *July 12, 1989* UVPLT *Eric*

Corrected help file to be consistent in saying what SUBARR = 0 means and changed the code to make it mean *all* subarrays.
Moved change to 15JUL89, nowhere else.

5184. *July 12, 1989* POPSGN *Eric*

Corrected bug in reading precursor comment lines of POPSDAT.HLP.
Moved to 15JUL89 and the VLA Vaxes this date.

5185. *July 13, 1989* UVCOP *Phil*

When UVCOP was copying a channel range, it attempted to adjust the u, v, w to correspond to the new reference frequency. The indexing in this step was 1 off.
Moved from Australia.

5186. *July 14, 1989* SMOSP *Phil*

Minor problem in that a DO-loop was using NUMPOL to decide on its maximum number of loops and this was not declared in BPASS. Changed to use NCOR.
Moved from Australia and nowhere else.

5187. *July 14, 1989* DATBND *Phil*

Tidied up the way this routine was dealing with flagged bandpass entries. If one channel was flagged, then it assumed the whole spectrum was bad. Also, the total-power correction section was not even examining the flags.
Moved from Australia and nowhere else.

5188. *July 14, 1989* DATGET *Phil*

Modified so that in addition to checking if autocorrelation data are required, it also checks to see if cross-correlation data are to be used. More tasks are now selecting on the basis of this.
Moved from Australia and nowhere else.

5189. *July 14, 1989* BPASET *Phil*

The weights used in the averaging of bandpass data were incorrect if one bandpass entry was flagged in any way. Modified to check on this.
Moved from Australia and nowhere else.

5190. *July 14, 1989* SPLIT *Phil*

Modified to select (from user adverbs) whether cross- or total-power or both is required. Also tidied up the use of CHANSEL. The user now passes the absolute channel numbers as adverbs and the task ensures that these are correct internally with respect to the BCHAN and ECHAN adverbs. Also fixed the help file.
Moved from Australia and nowhere else.

5191. *July 14, 1989* BPASS *Phil*
Modified to specify more explicitly whether total- or cross-power spectra are to be used.
Moved from Australia and nowhere else.

5192. *July 14, 1989* POSSM *Phil*
Modified to specify more explicitly whether total- or cross-power spectra are to be used.
Moved from Australia and nowhere else.

5193. *July 14, 1989* AVSPC *Phil*
Modified so that the way in which the CHNSEL array is dealt with is consistent with what AVGCHN expects.
Moved from Australia and nowhere else.

5194. *July 14, 1989* COMB *Eric*
Corrected test in the 'SPIX' operation for two identical frequencies. As it was coded, it failed in all executions where the second frequency was larger than the first. Cleaned up character-handling a little in 15OCT89 only.
Moved error test to 15JUL89 this date.

5195. *July 14, 1989* UVPLT *Eric*
Corrected two error branches — one tried to delete a plot file before it was created and the other skipped over all *ATPS*' close-down and accounting steps.
Moved corrections to 15JUL89 this date.

5196. *July 14, 1989* LIBR.DAT *Eric/Kerry*
The non-existent directory $APL4PT2 was left in the LIBR.DAT files for SYSNRA01:, SYSVLAC1:, SYSALLN:, and SYSSUN:. This caused NRA01 at least to use APLUnix: rather than APLCVEX: versions of Z-routines, thereby messing up the interactive use of terminals among other things.
Moved to 15JUL89 this date.

5197. *July 17, 1989* FILLM *Bill J*
FILLM had assumed that "time of geometry" was equivalent to time of start of integration. The "time of geometry" is updated no more frequently than every 10 seconds so, for shorter integrations, the times were incorrect. Also fixed a small coding error in error-handling in FLMUV subroutine.
Moved to 15JUL89 this date.

5198. *July 17, 1989* Linear polarization *Bill C*
The following changes were made in an attempt to support observations made using linearly polarized feeds in the manner used by the Australia Telescope:

- PCAL — Modified to solve for X-Y "leakage" terms. Added routine XYCALC.
- PCAL — Changed help file: short description of using linear data.
- DATPOL — Changed to call LXYPOL to compute transformation matrices for X-Y data.
- LXYPOL — Changed to compute matrices to transform observed XX, YY, XY and YX data to corrected RR, LL, RL and LR data.
- POLSET — Changed to recognize 'X-Y LIN ' type instrumental polarization models.
- DGHEAD — Changed to relabel XX, YY, XY, YX data as RR, LL, RL, LR, if it was having the polarization corrections made.
- DGINIT — Changed to treat XX, YY, XY, YX data as RR, LL, RL, LR, as it should be in this form when it gets to DGGET.
- PRTAN — Changed to recognize 'X-Y LIN ' type instrumental polarization models.

None of these modifications have been debugged due to a lack of suitable data, but the changes should have no impact on the calibration of data obtained with circularly polarized feeds. The general method of calibration will be to convert the corrected XX, YY, XY, YX data into RR, LL, RL, LR so that the bulk of the *ATPS* software can properly deal with it.
Moved from Australia, nowhere else.

5199. *July 17, 1989* DDT *Eric*
Changed DDTSAVE.HLP and DDTLOAD.001 to build an array of results (bits agreement, MAXFIT differences) and to display them at the end (as well as while the job progresses). Changed to be selective in tape loading, to use CCHRG in all three tests, to be more forgiving in UVDIF (the large case had 32,000 differences because the uv test was too tight for single-precision floating).
Moved to 15JUL89 as well.

5200. *July 17, 1989* — Helps — *Eric*

Added 1-liners and categories to 11 L*.HLP and 20 M*.HLP. Removed obsolete MMPAS.HLP.
Moved to 15JUL89 nowhere else.

5201. *July 18, 1989* — CLREFM — *Chris*

CLREFM no longer reports no errors if it receives an error status of 2 (cannot find or open specified CL table) from CALINI. CLREFM previously did nothing in these circumstances and returned an error status of zero; this caused CLCOR to create a spurious CL file with no entries and then process it if GAINVER was one greater than the number of CL tables actually present. Any tasks that relied on CLREFM returning an error code of zero if the requested CL table did not exist should be modified to check for and ignore error code 2.
Moved nowhere.

5202. *July 18, 1989* — DATBND — *Phil*

Modified to cope with all variations of polarization data that may be thrown at it. In the process of this, the routine was tidied up considerably and made easier to maintain.
Moved from Australia and nowhere else.

5203. *July 18, 1989* — BPASS — *Phil*

Added several new features: it will now recognize various types of polarized line data and knows what to do with them; it will now calculate "channel 0" under the control of the CHANSEL adverb; it will, if requested, print out the closure errors it finds during the least squares solution stage; and it will amp-scalar average data prior to determining the bandpasses if requested. Included an updated BPASS.HLP.
Moved from Australia and nowhere else.

5204. *July 18, 1989* — AP 120B — *Eric*

The FPS array processor still requires INTEGER*2 as its arguments. Unfortunately, the code provided by FPS to translate microcode and vector-function-chainer routines into "Fortran" puts only INTEGER. This is now 4-byte integers in *AIPS* and causes problems. Changed INTEGER to INTEGER*2 in Q120B: versions of DIDSUB, FINGRD, GRDCC, MAXMGV, MCALC, PTSUB, and RECT.
Moved to 15JUL89 this date.

5205. *July 18, 1989* — Unic Systems — *Kerry*

Deleted a large number of obsolete or otherwise unused procedures, sed scripts, and the like from all Unix system areas. Put back an improved, faster version of SEARCH. in SYSUnix:. Moved in a new AREAS.CSH matching the revised AREAS.DAT. Also in SYSUnix:, changed PP. to redirect stdout to stderr and FCOPTS.SH and LDOPTS.SH to define NOOPT as null.
Moved to 15JUL89 this date.

5206. *July 18-19, 1989* — ZDIR — *Eric*

Changed VMS and Unix versions of ZDIR to accept AIPS_VERSION as a standard area like TST.
Moved to 15JUL89 this date.

5207. *July 19, 1989* — VMS installation — *Eric*

Changed VMS installation procedures:

- IBATFINI — changed form of input line to POPSGN.
- IBUILD — changed form of input line to POPSGN.
- ICREDCL — added more names for queues to ASSNLOCAL.
- ILOAD — changed date to 15OCT89 (TST only).
- IPROMPT — raised upper limit of number of interactive AIPS.
- IREADTAP — dropped obsolete parts of "you can delete ..." display.
- TRANSPRT — dropped some obsolete areas and files from the lists of those ignored.

Moved all but ILOAD to 15JUL89 this date.

5208. *July 19, 1989* — GRIDR — *Eric*

Corrected addressing bug in moving the projection type from the random parameters to the image coordinates parts of the header.
Moved correction only from 15OCT89 this date.

5209. *July 19, 1989* Unix Systems *Kerry*

Changed in the Alliant system area:

OREADME.	—	Updated documentation.
FCOPTS.SH	—	Updated Fortran options.
LDOPTS.SH	—	Updated linker options.

Changed in the Convex system area:

FC.	—	New file, Fortran compilation.
KC.	—	New file, "kludge" compilation.
FSC.	—	New file, Fortran compilation.
OPT2.LIS	—	Updated list of routines to optimize.

Changed in the NRAO1 system area:

AREAS.CSH	—	Changed to match revised AREAS.DAT.
ASOPTS.CSH	—	Changed to select IEEE floating-point.
ASSNLOCAL.SH	—	Added line printer definition.
ASSNLOCAL.CSH	—	Added line printer definition.
CCOPTS.SH	—	Changed to select IEEE floating-point.
DACK.	—	Changed to handle B and C *ATPS* file formats.
FC.	—	Changed "at" file handling.
FCOPTS.SH	—	Changed to select IEEE floating-point.
FSC.	—	Changed "at" file handling.
LDOPTS.SH	—	Changed to select IEEE floating-point.
OPT2.LIS	—	Updated list of routines to optimize.
SPACE.	—	Updated to report all six disks.
VERSATEC.	—	Changed to use "anonymous" ftp acount on CVax.
AREAS.SH	—	New file, same as SYSUnix:.
DRUN.	—	New file, runs stand-alone programs in debug mode.
LIBR.	—	New file, finds appropriate link files.
ZLPCL2.QMS	—	New file, command file to use QMS as line printer.

Also added CCHRG to INSUnix:INSTEP3. and added to SYSSUN:OREADME. a summary of the experiences with SUNOS 4.*x*.

Moved to 15JUL89 this date.

5210. *July 20, 1989* FARAD *Chris*

New task. Calculates the ionospheric Faraday rotation measure along the line of sight and enters it in a CL table. The rotation measure is calculated using the total electron content of the F2 layer and an offset dipole model of the Earth's magnetic field. The electron content may be read from an external file of hourly values in the format used by the monitoring station at Boulder, Colorado or calculated using an empirical model. The program contains stubbed routines that will be used to read f0F2 data in some future version.

Moved nowhere.

5211. *July 20, 1989* TVFLG *Eric*

Corrected a format that was too long when asking for two values for the clip levels. Changed the order of the code when handling the menu to reduce the number of commands sent to the TV. They are too slow, especially on the IVAS, for things that don't change anything.

Moved changes from 15OCT89 this date and to Convex to test.

5212. *July 21, 1989* DDT *Eric*

Corrected message levels in AU3A (5 becomes 4 for inquiries), KWICK (4 becomes 5 for PRINT), ACOUNT (2 to 5 for final accounting as in GTPARM at start), TABCOP (6 to 3 okay copy) APCLN (5 to 4 on beam), MX (6 to 4 on informative).

Moved nowhere.

5213. *July 24, 1989* FILLM *Chris*

Added a loop to initialize the random parameters to zero to the top of subroutine FLMDAT. FILLM allocates space for the random parameters WEIGHT and SCALE, but does not necessarily fill these in. This meant that the garbage values that happened to be in these spaces were written to the output uv file; in some cases, the value happened to have the bit pattern for IEEE NaN, with fatal consequences for any program that tried to do anything with this number (for example FITTP, which multiplies it by ± 1).

Changed in 15JUL89 this date.

5214. *July 25, 1989* UVDIF *Eric*

Corrected erroneous handling of times and changed message levels, raising them if there are values printed.
Moved to 15JUL89 this date.

5215. *July 25, 1989* Message levels *Eric*

Changed message levels in programs to be more consistent: 6 and above are errors, 5 is a serious result, 4 a less serious result, and 2 and 3 are for progress, conditions, etc. Changed MX, GETCTL, VISDFT, UVGRID, and UVTBGD.
Moved some of the fixes to 15JUL89 only.

5216. *July 25, 1989* ZR32RL *Eric*

Changed APLGEN: versions of ZR32RL and ZR64RL. The Vax stores integers in "word-swapped" order, but not floating values. Thus, the exponents are located in the lowest-order 16 bits on a Vax and the highest-order 16 bits on reasonable machines. CC tables were being read by IMLOD with blanked values of the fluxes.
Moved to 15JUL89 this date.

5217. *July 25, 1989* PRTMSG *Eric*

Changed the order of the closing of the line printer and the message file. Unix systems want to call MSGWRT while closing the line printer and this caused a message from ZMSGCL.
Moved to 15JUL89 this date.

5218. *July 25-26, 1989* PRTCC *Eric*

Added error branch tests on WRITE statements formatting the display. This avoids tracebacks when there are bad components. Added the display of a character to indicate an incomplete sum — it was forgotten on the shortest display. Corrected string handling of selection string.
Moved to 15JUL89 these dates.

5219. *July 26, 1989* TAFLG *Eric*

Corrected error in handling flag-description string introduced in the overhaul. CHARACTER variables cannot be used where hollerith are expected.
Moved to 15JUL89 this date.

5220. *July 27, 1989* VLAPROCS *Bill J*

Changed the defaults in CALIB and LISTR parts of this procedure from vector averaging to scalar. Default FREQID also should be FREQID = 0.
Moved nowhere.

5221. *July 27, 1989* Addressing *Eric*

The buffers having their bytes flipped have to be declared INTEGER*2 since that is what they are and sometimes they land on that sort of address. Risc architectures care a lot about such things. Corrected ZADDR in generic, VMS, and Unix, ZBYTFL in generic, and ZBYTF2 in generic, VMS, and Unix.
Moved to 15JUL89 this date.

5222. *July 27, 1989* PRTTP *Eric*

Buffers must have their bytes flipped before calling ZDM2DL to convert Modcomp double-precision to local. Put in ZBYTFL calls in PRTTP as needed.
Moved to 15JUL89 this date.

5223. *July 27, 1989* ZADDR *Eric*

Changed generic, VMS, and Unix versions of ZADDR to declare input variables to be INTEGER*2. Otherwise, alignment problems can occur on risc computers when the inputs are on INTEGER*2 addresses.
Moved to 15JUL89 this date.

5224. *July 28, 1989* UVCMP *Chris*

Made UVCMP much more intelligent with regard to adding the WEIGHT and SCALE random parameters when compressing data. UVCMP previously added the random parameters needed for compressed data without checking whether they already existed. This caused problems with data read by FILLM. FILLM generates WEIGHT and SCALE parameters even if the output data set is not compressed (these parameters are then zero); UVCMP appended a second set of WEIGHT and SCALE parameters containing real values; subsequent programs only saw the first set (written by FILLM) and scaled the compressed data by a factor of 0.0 and assigned it a weight of zero. The end result was that UVCMP deleted all data. UVCMP should now deal sensibly with all uncompressed data that already have WEIGHT and SCALE random parameters, provided that neither of these is already duplicated.
Moved to 15JUL89 this date.

5225. *July 29, 1989* INDXR *Eric*

Changed help file to allow CPARM(3) < 0 as the instructions say to use. Changed Fortran to call CL-table routines only when a CL table is being written.
Moved nowhere.

5226. *July 29, 1989* FILLM *Eric*

Changed Fortran to set the default for the 2nd character of BAND to the first character. Then, the "blank-means-first-found" default takes over. Corrected Fortran to close and open tables all the time. The code that attempted to avoid unneccessary opens and closes caused the task to fail to do required ones. Changed help file to explain new BAND usage and to describe what is ignored when DOALL is true.
Moved nowhere, 15JUL89 required different changes.

5227. *July 30, 1989* FITTP *Eric*

It was possible to set DONEW in such a fashion that critical tables were not written with *uv* data sets. Changed program to write critical tables in binary tables format if that is the only one that works, despite DONEW.
Moved to 15JUL89 this date.

5228. *July 30, 1989* VMS *Eric*

The maintenance of the VLA has been very difficult due to the use of non-*AIPS* area to control *AIPS* procedures. Deleted Vax1 and Vax3 NRAO$ROOT1:[AIPS] files as much as possible. Brought in the following better ideas from the procedures that were there:

AIPS.COM — Changed to type NOTICE.TXT if present in AIPS_PROC:.
AIPSUSER.COM — Added symbol FIXFITS.
NRLOGIN.COM — Changed name of notice.txt to NRNOTICE.TXT.
NRNOTICE.TXT — The former SYSVMS:NOTICE.TXT.
NOTICE.TXT — Sample file placed in SYSAIPS (Unix could do this too?).
AIPSINIT.COM — Batch job to run AJAX and BSTRT1 at boot time.
BOOTUP.COM — Changed to use AIPSINIT to do long boot jobs asynchronously.

Moved to 15JUL89 this date.

5229. *July 31, 1989* FITTP *Chris*

Fixed bugs in FITTP associated with compressed *uv* data. Firstly, the subroutine that dealt with compressed data was not taking the fact that the variable NRPARM recorded the number of random parameters being written to tape and not the number of random parameters in the disk file; if WEIGHT and SCALE occurred at the end of the random parameter list, they were not written to tape and the number of random parameters in the disk file was two more than was assumed. This lead to ZUVIPN (which expands the compressed data) being called with the wrong offset into the data buffer. This was fixed by testing whether WEIGHT and SCALE had been deleted before calling ZUVIPN. Secondly, the index into the scratch buffer used to store the expanded data was being offset by NRPARM before transferring data to the output buffer. This was fixed by removing the offset. It is likely that all compressed data written to FITS tape before this date is corrupt.
Moved nowhere.

5230. *August 4, 1989* SETAN *Bill C*

New task: reads antenna and subarray information from a text file and writes it to a specified AN table, creating the table if necessary. Also created SETAN.HLP.
Moved from Oz to nowhere.

5231. *August 4, 1989* QUACK *Bill C*

Modified to correct for a bug (feature?) of SOURNU that returns 1 source found even when all source names were blank. QUACK should now work when no sources are specified.
Moved from Oz to nowhere

5232. *August 4, 1989* LISTR *Bill C*

Added option to print source elevations when processing SN or CL tables. Also changed LISTR.HLP.
Moved from Oz to nowhere.

5233. *August 4, 1989* SOUELV *Bill C*

New routine to compute source elevations from values in common set by GETANT and GETSOU.
Moved from Oz to nowhere.

5234. *August 4, 1989* GETJY *Bill C*

Fixed bug handling the default value of the adverb EIF. This bug would cause erratic printout of the fitted source flux densities.
Moved from Oz to nowhere.

5235. *August 4, 1989* UNCAL *Phil*

New task to uncalibrate AT data: it takes the CU and BU tables generated by the on-line system (they contain the inverse of the calibration applied) and translates them into CL and BP tables. These can then be applied to the data in the normal fashion, so uncalibrating the data. Also created a help file.
Moved from Australia and nowhere else.

5236. *August 4, 1989* MAKMAP *Phil*

MAKMAP was not removing the CH/FQ table after each group of eight channels. This had no effect for multi-source files (apart from an extraneous ZCREAT message), but was causing single-source files to fail after the first eight channels. Relinked HORUS.
Moved from Australia and nowhere else.

5237. *August 4, 1989* CHNDAT *Phil*

Minor modification to ensure that if no IF (*i.e.*, CH/FQ) table exists that BUFFER(5) (*i.e.*, the number of rows) is set to the correct value.
Moved from Australia and nowhere else.

5238. *August 4, 1989* ISPEC *Phil*

New task to plot a spectrum for a specified pixel or region of a map. User passes PIXXY or BLC/TRC and will get the spectrum for that whole region appearing in a PL extension. Also created ISPEC.HLP.
Moved from Australia and nowhere else.

AIPS Order Form

1. Name and address of Contact Person: _____

   ☐ Address label on back is correct _____

   include street address for UPS delivery _____

   _____

2. ☐ new order ☐ reorder

   (*N.B.*: If you have received a plastic mailing container from us, we insist that you use it for a reorder. Also return tape(s).)

   Version of *AIPS* currently running: _____

3. *AIPS* version desired: . . . . . ☐ 15-Apr-1989 (pre-overhaul)
   (Shipped ≈ 1 week after release date) ☐ 15-Oct-1989 (post-overhaul)

4. Tape type desired:
   (*AIPS*, VMS only) . . . . . ☐ Vax/VMS `BACKUP`
   (*AIPS*, Unix only) . . . . . ☐ Unix tar
   Version of Unix system in use: _____
   N.B. we need to know this. *e.g.*, bsd4.*x*, Sys III, Sys V, V7, *etc.*
   (*AIPS*, neither Unix nor VMS) . . . . . ☐ FITS compressed text format
   (`DDT` test package: ≥ `15OCT89`) . . . . . ☐ FITS binary data ("large" on 6250 bpi only)

5. Tape density desired: . . . . . ☐ 1600 bpi ☐ 6250 bpi ☐ `QIC 24` (tar only)

6. There are gripes on (returned) tape: . . . ☐ Yes ☐ No

7. Printed documents requested: . . . . . ☐ Full `15OCT86` *COOKBOOK* (no binder)
   ☐ `15OCT86` *COOKBOOK* chapters: _____
   ☐ `15APR87` *GOING AIPS* Vol 1 (no binder)
   ☐ `15APR87` *GOING AIPS* Vol 2 (no binder)
   ☐ *AIPS* Memo No. 59
   ☐ *AIPS* Memo No. 60
   ☐ *AIPS* Memo No. 61

8. Custom binders requested: . . . . . ☐ *COOKBOOK*
   (now free) ☐ *GOING AIPS*, Vol. 1 ☐ *GOING AIPS*, Vol. 2

Send order form to: *AIPS* Group, NRAO
Edgemont Road
Charlottesville, VA 22903-2475 USA

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July 15, 1989

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A I P S L E T T E R

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A newsletter for users of the NRAO
Astronomical Image Processing System

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CHARLOTTESVILLE, VA.
DEC 14 1989

TgXset by WDC

Definition of the *AIPS* Project

In a memo to the NRAO Scientific Staff dated 20 September 1989 the Director of the NRAO, Paul Vanden Bout, made the following statements about the goals of the *AIPS* project and on the rearrangement of the management of the project.

"There has been considerable discussion within the Observatory recently about the AIPS project, both its management structure and its long–range future. The discussion has been useful and I have written this memorandum to reaffirm the goals of the AIPS project, describe the management restructuring that has been put in place, and announce the appointment of a long range planning group for NRAO analysis software.

"AIPS is the only array telescope software reduction package for which NRAO has long-term plans. The Observatory is committed to continuing the AIPS project with these goals:

1 To develop and maintain algorithms and portable code for calibration and imaging of radio astronomical data, with emphasis (but not exclusive concentration) on data from the VLA and VLBA. To develop and maintain portable code for general image analysis.

2 To maintain AIPS in the NRAO computing environments in Socorro and Charlottesville in support of VLA and VLBA data processing by visiting users and by NRAO scientific staff.

3 To help non-NRAO user sites install and maintain AIPS in their computing environments when these environments are inside the general envelope of AIPS portability; to help these sites to assist one another if not.

4 To benchmark AIPS code performance in new hardware and software environments, both to assist NRAO and its user sites with hardware procurements and to explore ways to enhance the performance of AIPS.

5 To educate and inform users about AIPS through tutorial manuals, workshops, and consultation.

"All of these goals are important to the Observatory's mission and all have my full support.

"The following management changes are effective immediately. Bill Cotton replaces Eric Greisen as Project Manager, making it possible for Eric to take a long delayed and much deserved leave from the Observatory. We all appreciate the enormous contribution Eric has made in over ten years of developing and guiding AIPS, and we look forward to his eventual return to the AIPS project as a design specialist. Gareth Hunt is appointed Deputy Project Manager, with responsibility for AIPS activities in Socorro.

"The long range directions AIPS could take, as well as long range goals and strategies for all NRAO data analysis software, merit serious attention and discussion. Accordingly, I have asked Tim Cornwell to head a long range planning group for analysis software. The group membership will include all sites and areas of computing: array telescope and single dish data analysis, hardware, software, and computing management. A few experts outside NRAO will also be added, from our user community or elsewhere as appropriate. The group will discuss strategic issues dealing with both technical and management aspects of analysis software projects, for both array and single dish data, and advise me and software project managers about such issues."

AIPS Overhaul

The 15OCT89 release of *AIPS* will be the first of the "overhauled" version of the software. The overhaul involved the translation of the Fortran source code from modified Fortran 66 to strict Fortran 77 (after the use of a preprocessor). This should make the installation of *AIPS* on newer computer architectures simpler and remove the source (2-byte integers) of many compiler problems on all systems. In addition, the new language is friendlier to programmers. More details of the *AIPS* overhaul were reported in the 15APR89 edition of the *AIPS*Letter.

The overhauled version of *AIPS* has been tested extensively inside the NRAO and most of the problems associated with this change are thought to have been fixed. As an added precaution, we will maintain a version of the software for 15OCT89 on disk on an NRAO computer in which major bugs will be fixed. These fixes may then be accessed from user sites using the AIPSSERV facility described in a later article.

Due to the extensive changes in the file formats used in *AIPS* there will not be an UPDAT procedure to translate the file structures from older versions of *AIPS* as there has been in the past. To move data from an older version of *AIPS* to the 15OCT89 or later versions, data or images must be copied to FITS format (either disk or tape) from the old version and read into the new version. This also applies to *AIPS* files written using BAKTP or other system-dependent backup procedures. For this reason, we advise sites installing the 15OCT89 or later AIPS to keep the old version of the AIPS program, task FITTP, and the *AIPS* system files necessary to run these until all users at their site have copied their data to FITS format files.

Users having custom *AIPS* software will need to translate this software to the new language standards. Most of this translation can be done with software provided in the 15OCT89 and later *AIPS* releases. Detailed instructions on using this software and other changes are distributed with the installation tapes.

Not all sets of "Y" routines have been translated yet. Those that have not been overhauled have been removed from the 15OCT89 release but will be reinstated when they have been translated. The affected systems are Args, Lexidata and Comtal Vision 1/20.

User Agreement

Starting with the 15OCT89 release of *AIPS* all user sites will need to provide the NRAO with a signed "User Agreement" form. This "User Agreement" will be a no-cost item for sites engaged in basic research in astronomy. The need for an *AIPS* "user agreement" has arisen for several reasons. The most important is that we want all *AIPS* sites to obtain their copies of *AIPS* from the NRAO and thereby to be made aware of the restrictions that apply to their use of the code and to our support of it. For sites doing astronomical research, these restrictions are only to maintain the proprietary nature of the code and to direct third parties who wish to receive the code to the NRAO. Once properly signed, a User Agreement remains valid for 5 years and does not need to be renewed before this time. A copy of this agreement is printed in the back of this *AIPS*Letter. The agreement should be signed by an individual in a position to take responsibility that the user group will follow the agreement. This may be a department chairman or an administrative officer. Mail signed forms to Amy Shepherd, NRAO, Edgemont Road, Charlottesville, VA 22903-2475

AIPS Calibration Package

Much of the recent work in *AIPS* has been on the calibration package for interferometer data; in recent months this package has begun to stabilize. The calibration package is complete (or nearly so) for VLA data and most of the functions needed for VLBI data are also available.

A recent addition is the use of a "compressed" uv data format which uses up to a factor of 3 less disk space for large line projects. Not all *AIPS* tasks yet honor compressed format data but it is supported in all of the main calibration package routines and many others. This format represents data in a 16 bit form in most implementations and may not be suitable for cases where high (> few 1000:1) spectral dynamic range is needed in the raw data or for calibrated continuum data to be used for high dynamic range images.

Ionospheric Faraday rotation corrections can now be made using task FARAD. This task allows use of either a model of the ionosphere using the mean Sunspot number as the free parameter, or, direct measurements of the total electron content of the ionosphere. In the latter case, a file containing these measurements made in Boulder, Colorado is needed to calibrate data from the VLA. This file can be obtained from NRAO, when available, as described in a later article.

MKIII VLBI data is supported in a limited way beginning with the 15OCT89 release. The new task, MK3IN, can read single polarization line or continuum data from "A" tapes. The *AIPS* calibration system is just beginning to be used for MKIII data for fringe fitting and other calibration so problems may be uncovered for this type of data. This area is being actively developed so substantial improvements are expected soon in the ability of *AIPS* to process MKIII data.

Personnel

As of 15 September 1989, Bill Cotton has assumed the role of project manager and Eric Greisen has returned to the *AIPS* programming staff. We wish to thank Eric for his many years of inspired leadership of the *AIPS* project. Gareth Hunt has become the Deputy AIPS Manager and will be responsible for *AIPS* operations in Socorro.

We are happy to announce that the former Nancy Wiener was married to Ron Maddalena of NRAO-Green Bank. We are sad to announce that this event involved a move to Green Bank so Nancy is no longer a member of the AIPS group. Due to a hiring freeze at NRAO we have been unable to replace her position.

In September, Glen Langston joined the *AIPS* project as a programmer. Glen has extensive experience in VLA, VLBI and single dish radio observations and will assume much of the responsibility for the interferometer imaging functions in *AIPS*. Glen is a valuable addition to the *AIPS* programming staff.

Document and Software Distribution by AIPSSERV

The NRAO maintains a mail-based file server, AIPSSERV, which is available for use by *AIPS* users to fetch files from `CVAX`. Detailed instructions for using this facility may be obtained by sending an E-mail message containing the single word "`help`" to one of the following addresses: `aipsserv@nrao.edu`, `aipsserv@nrao.bitnet`, `...!uunet!nrao1!aipsserv` or `6654::aipsserv`.

We intend to use this facility to distribute text files such as the ionospheric measurements needed for task FARAD, bug fixes for software in the 15OCT89 release, and the contents of the CHANGE.DOC files (documentation of software changes). A general guide to special files for distribution by AIPSSERV will be kept in file DOC:README. To obtain a text file in plain text form send AIPSSERV a message of the form "`sendplain logical:filename.ext`" where `logical` is the logical name of the directory and `filename.ext` is the name of the desired file. Multiple files may be obtained by multiple "sendplain" commands one per line. Individual uses are discussed separately below.

Ionospheric data:

The ionospheric total electron content files will be kept in a directory with logical name AIPSIONS. These files will be named TECB.yy where yy are the last two digits of the year. The data will be entered into the appropriate file as it becomes available to the NRAO; this is typically several months after the fact. As an example, to fetch the file containing information for February 1989 send AIPSSERV the message "`sendplain aipsions:tecb.89`".

Bug fixes in 15OCT89:

For the 15OCT89 release only, we will maintain a version of the source code in which any remaining serious bugs will be fixed. These corrected routines can be obtained via AIPSSERV. In addition, AIPSSERV will provide a docmentation file describing fixes that have been made in this software. This will allow user sites to determine if the fix they need has been made, and if so, which files to fetch. This file is named DOC:FIXED.DOC. To fetch this file, send AIPSSERV the message "`sendplain doc:fixed.doc`". After receiving this file if you determine that you need `aplxxx:subr.for` then send AIPSSERV a two line message containing "`version old`" to specify the version of *AIPS* desired and "`sendplain aplxxx:subr.for`" to obtain the desired file.

CHANGE.DOC:

The old versions of the software change documentation files, CHANGE.DOC, will be kept in area AIPSPUBL with names of the form "CHANGED.yyn" where "yy" is the last two digits of the year number and "n" is "A", "B", "C" or "D" for the 15JAN, 15APR, 15JUL or 15OCT release. For example, to obtain the CHANGE.DOC file for 15OCT89 send AIPSSERV the message "`sendplain aipspubl:changed.89d`". Note that we are no longer distributing CHANGE.DOC as part of the *AIPS*Letter.

AIPS - ISIS Comparison

Recently *AIPS* calibration and imaging software was compared with the ISIS system. ISIS is a VLA specific software system which was designed to take advantage of the hardware of the Convex computers in the NRAO-Socorro facility. NRAO does not intent to distribute ISIS outside of the observatory; but, a comparison of its speed with that of *AIPS* is instructive.

It is frequently argued that a general purpose system such as *AIPS* pays a high penalty in execution time for being both portable and general. A comparison of *AIPS* with ISIS on a machine for which ISIS was optimized shows, in this instance, what penalty, if any, *AIPS* pays for its portability and generality. The pair of reports below indicate that the penalty is gratifingly small.

These tests gave essentially the same results in both the *AIPS* and ISIS systems except for a bug that was found and later corrected in the ISIS polarization calibration routine. Several areas for improving the speed of the *AIPS* calibration routines were identified on the basis of these tests; especially the least squares routine used to solve for antenna gains. The basic results of these comparisons were that *AIPS* was slower than ISIS for some of the calibration functions and faster in others. However, *AIPS* was much faster for imaging continuum data and marginally faster at imaging spectral line data in "typical" computing environments.

Continuum Tests

The following discussion of the relative performance of *AIPS* and ISIS for continuum data is from VLA Computer Memo 181: "The Relative Performance of AIPS and ISIS" by Rick Perley, Phil Diamond and Chris Flatters (28 Sept. 1989).

> "Considerable discussion has occurred over the last summer concerning the relative merits of ISIS and AIPS for data calibration and basic imaging. Various reports, invariably anecdotal, have circulated which claimed enormous advantages of ISIS, especially with respect to its speed in performing the essential steps of data listing, gain solution, and image generation. However, no quantitative study has yet been attempted.
>
> "Recently, the AIPS programmers discovered that the CONVEX AIPS code had been compiled without optimization, which had the especially damaging effect of forcing all vector operations to be scalar. [This condition lasted for a few weeks on the Convex C1s in the AOC only - ed.] It would thus appear likely that many of the reports circulating about were based on impressions gained when the AIPS code was at a distinct disadvantage.
>
> "It is obviously important to compare the running speeds of ISIS with AIPS. The results of such tests not only allow detection and correction of errors in codes, but also will highlight programs which are especially efficient, and which can then be transferred from one set to the other. From

the user's point of view, it is important to know which calibration route, if any, holds especial advantages.

"For these reasons, we have performed benchmarking tests. We selected a short but representative database for comparison of the basic tasks of database filling, matrix listing, gain solution and application, polarization calibration, and imaging. No attempt was made to compare flagging and editing speeds, as these are dominated by user skill levels, as well as being intrinsically subjective. Tests comparing spectral line functions were performed separately and will be reported separately.

"The remaining sections of this report cover the following items:

(1) Discussion of the database and the operations which were performed. We also discuss the methods of timing which were employed.

(2) Display of the results in tabular form.

(3) A short discussion of the differences and implications.

"**The Database.** We selected a continuum database, taken from a 1.5 hour observing run on 14 September. These observations were at 3.6cm, and included 24 antennas. (Twenty-seven antennas were present for the initial 5 minutes, but three were then transferred to a separate subarray for VLB observing.) The data were of excellent quality, and no editing was required. Despite the short duration, polarization calibration was feasible, since the observer thoughtfully observed a strong calibrator throughout the run, giving sufficient parallactic angle coverage for an excellent solution.

"The tests were performed after ensuring all other users were off the system. We monitored both wall clock time (through use of the UNIX 'date' command), and computer CPU time. This latter quantity seems a little slippery to quantify, so we attempted numerous methods. For AIPS tasks, we recorded the CPU and elapsed times, as given by each task upon completion. Note that the CPU times reported by AIPS are the sum of system plus user time. Some ISIS tasks report the CPU usage (broken down into 'user' and 'system' times), and we recorded these. For all ISIS tasks, we monitored CPU usage through the UNIX 'ps' and 'w' commands. The results of these two always closely tracked (within 5 seconds) the accounting information given by the program itself. It proved not possible to monitor the AIPS tasks in the same way, since the shed task disappears from the system upon completion. However, by monitoring the task performance as it executed, we are confident that the statistics given upon completion by the AIPS task can be compared to those determined for the comparable ISIS task within a few seconds.

It is interesting to compare the database sizes. On the Dec-10, the two data bases (for the 'AC', and 'BD' IFs) together took 13,480 blocks, or 6.90 Mbytes. On ISIS, after filling with the same PASSFLAG parameters, the database took 7.80 Mbytes. Comparing ISIS with AIPS required filling with PASSFLAG = BOTH, after which the ISIS database took 8.34 Mbytes, the AIPS database 8.28 Mbytes. Thus, the use of data compression in AIPS has made the databases in the two systems the same size to better than 1%.

"The various tasks are described below, with the ISIS/AIPS names given as indicated.

1. DBFIL/FILLM The data were located approximately halfway down the tape. We monitored both the wall clock time and CPU time to space down the tape to the data, and to actually read the data into the file. We ran with PASSFLAG = BOTH, to ensure the same data were filled, since AIPS has a more liberal interpretation of what constitutes bad data. It was not

possible to separate CPU times in AIPS for these two operations, so only the sum is given in the table.

2. LISTER/LISTR We produced a matrix listing of the data, with ampscalar averaging over the entire scan length for all sources and scans. We printed both the averages and the rms's. The test was run twice, the first without applying the gains, and the second with gains applied in order to assess the effects on performance of gain application. (Since the data were uncalibrated, the actual listings were identical.)

3. ANTSOL/CALIB The next step was to produce the calibration parameters. The fluxes were first entered manually (using SETJY/SETJY), from values determined earlier. (No accounting was attempted here for reasons the authors hope are obvious.) We used ampscalar averaging, solving for 24 antennas, with UVLIMITS appropriate for 3C48 and 3C138. The same reference antenna (#4) was chosen to allow detailed comparison of solutions and polarizations. Listings of the solutions were produced, and these timings were separated from the solution times.

4. GTBCAL/CLCAL We used 2-point interpolation.

5. POLCAL/PCAL The database contained two calibrators which were tracked throughout – one for calibration of the source, and other specifically intended for polarization calibration. We used both sources, with the same reference antenna in both programs.

6. MAKMAP/HORUS Finally, we produced an image. Two tests were done, the first being a 512^2 image, the second a 128^2 image.

"**The Timing Results.** The table at the end of this report displays the results of the tests. All times are in seconds. Both the CPU and elapsed times are given, as are comments pertinent to the test performed. Note that the AIPS CPU time for the data loading test is not broken down into 'move time' vs. 'load time'.

"**Discussion.** The table shows that AIPS is markedly faster than ISIS in most of the areas tested. The difference is most marked in imaging, where the ratio exceeds a factor of two. There is no great difference in filling data, although we note that ISIS is slower in spacing down the tape, but is considerably faster in actually loading the data. It might interest some to note the tape-to-disk data transfer rates are approximately 65 and 30 Kbytes/sec for ISIS and AIPS, respectively. We do not know the reason for these differences in tape spacing and loading, but an explanation has been suggested and is being tested.

"For matrix listings, AIPS has a clear advantage – nearly a factor of two. The advantage reverses for generating the solution. Apparently the cause of AIPS' relative slowness is known and will be shortly addressed. The test should be repeated after any changes are made to the algorithm. The listing of the gain solutions is similar for both systems, and in any event, takes very little time compared to the generation of solutions. The same can be said of applying the gains, which is considerably faster in ISIS, but takes only a very short time in either system. Calculation of polarization is similarly quicker in AIPS, although the factor is not large. The large difference in imaging is very significant, because in general, one calibrates the data only once, but commonly makes images many times.

"Overall, the results surprised the testers. We had assumed, along with everyone else, that code especially written for the CONVEX would have definite advantages in speed over the much more general purpose AIPS. But rumour and assumption are here clearly deceiving, and the results

of these tests clearly show that AIPS is to be preferred for data calibration and imaging, when speed and efficiency are important.

"Three additional, and very important issues relating to deciding which software package should be employed by the users (both in-house and visitors) are the questions of ease of use, reliability, and responsiveness. With regard to the first, it is certainly true that ISIS has the advantage of familiarity, while at the same time, the generality of the AIPS package and its formidable list of adverbs for the basic calibration tasks will deter use. Two comments are appropriate: (1) The VLA-specific RUN file, provided by Bill Cotton, has largely removed the tremendous burden of sorting through the adverbs in CALIB and CLCAL to find the ones relevant to VLA data. (2) The user-unfriendly gain listings provided by LISTR will shortly be rewritten to provide the relevant information without disturbing the eye. We feel that AIPS calibration will soon be as easy as ISIS calibration.

"The last point is related to the second - having quick response to problems builds confidence. The recent structural changes to the AIPS group will, we expect, provide the needed level of support."

RESULTS OF CONTINUUM TIMING TESTS

Task	ISIS Elapsed Time	ISIS CPU Time	AIPS Elapsed Time	AIPS CPU Time	Comments
DBFIL/FILLM	420 + 120	200 + 65	300 +270	245	Spacing + Filling
LISTER/LISTR	82	64	45	40	No calibration, 1 IF
LISTER/LISTR	150	130	80	72	With calibration, 1 IF
ANTSOL/CALIB	60	42	110	97	Solutions
ditto	14	10	19	10	Listings
GTBCAL/CLCAL	12	5	19	14	
POLCAL/PCAL	100	80	75	58	
MAKMAP/HORUS	260	250	128	140	512^2 Image
ditto	253	245	109	105	128^2 Image

Spectral Line Tests

The following memo is a discussion of a comparison of *AIPS* and ISIS for spectral line data entitled "The Relative Performance of AIPS and ISIS for Line Data" by Phil Diamond, Arnold Rots and Bill Junor (15 November 1989).

"**Summary**. We performed tests of the efficiencies of the calibration and imaging routines in the AIPS and ISIS packages. Our results demonstrate that under typical conditions the two systems are very similar in speed and produce images which are essentially identical.

"**Introduction.** The purpose of this document is to compare the efficiencies of the AIPS routines with those of the ISIS system for calibrating and imaging spectral line interferometer data as run on a Convex C1 computer. The ISIS system was optimized for the C1 and makes especially heavy use of the large amount of memory available. We will present the results of a careful comparison of the relative performance of the two systems.

"In these tests we will compare the speed of calibration and imaging in these two systems. In all cases the images produced were equivalent so only the timing results are of interest. The bulk

of the time, both CPU and wall clock (real) in these tests are devoted to the imaging step. For this step we used the AIPS task HORUS which reads multi-source files, calibrates and edits data 8 channels at a time and then images the data one channel at a time. The equivalent ISIS routine is MAKMAP which calibrates and images all channels in parallel.

"The most important difference is in the use of memory. The AIPS task HORUS uses only enough memory to grid a single channel at a time; this reduces paging problems at a cost of increased I/O (the data must be read multiple times). ISIS routine MAKMAP reduces the I/O required by imaging all channels in parallel at the cost of potential problems with paging. Since the timing results will obviously depend on the loading of the machine (and thus the amount of memory available for a given process) these tests were carried out in different machine loading environments. The following sections describe the data used, the detailed tests and a discussion of the results.

"**The Data.** The data consist of a test VLA observation taken for the express purpose of exercising the on-line system and the data reduction systems. Two sets of seven scans on 3C48 were taken, with the correlator mode, number of channels and number of IF's varying from scan to scan. This was followed by two series of three 64-channel scans on 0023-263; the three scans comprised a "source" scan (looking for HI absorption) and two bracketing scans (in frequency) for bandpass calibration.

"**The Tests.** The first set of tests were run in a relatively unloaded, but not empty Convex C1 (YUCCA). Only CPU times were recorded for these tests. In the following, the ISIS program and equivalent AIPS task are given as (ISIS program/AIPS task).

1. Read data (DBFILL/FILLM): fill all data from tape onto disk.
2. Gain solutions (ANTSOL/CALIB): solve for all antennae, all IFs, all modes, all sources, scan ampscalar averaging; and list.
3. Apply calibration (GTBCAL/CLCAL): calibrate IF A on 0023-263 by itself.
4. Bandpass calibration (BASBP+ANTBP/BPASS): generate a single set of antenna-based bandpasses, three-point Hanning smoothing, vector (real/imaginary) solution.
5. Image data (MAKMAP/HORUS): make an image and a beam cube, 256x256x63, 1" cellsize from the 0023-263:0 scans, natural weighting, IF A, bandpass correction, 27,000 visibilities.
6. Write UV FITS to tape (UVFITS/FITTP): write 63 channels, 0023-263:0, with bandpass correction.
7. Write image to tape (FITS/FITTP): write two cubes (maps and beams), 256x256x63, to FITS tape.
8. Form continuum channel (CHZERO/AVSPC): for 0023-263:0, replace channel zero by the average of channels 8 through 55.

"After these tests were completed it was realized that paging could be a problem for MAKMAP under "typical" (i.e. heavy) loading conditions on the same computer. Several tests were then run to examine the results of loading on the relative performance of the AIPS and ISIS routines. For these tests, the equivalent programs in the two systems were initiated at the same time during normal daytime conditions to ensure that the loading was the same. For these tests the real (wall clock times) were recorded.

9. Gain solutions (ANTSOL/CALIB): solve for all antennae, all IFs, all modes, like 2 above.

10. Image data (HORUS/MAKMAP) make an image and a beam 256 x 256 x 63 similar to test 5. above using the same gridding convolution function in HORUS and MAKMAP.

11. A repeat of 10.

12. A repeat of 10.

The timing results are given in the following table. All times are in seconds.

RESULTS OF SPECTRAL LINE TIMING TESTS

Task	ISIS Real Time	ISIS CPU Time	AIPS Real Time	AIPS CPU Time	Comments
1. Read data		338.0		700	
2. Gain solution		52.3		140	
3. Apply cal.		(1)		8.8	
4. Bandpass cal.		19.6		122.0	
5. Image		1088.3		3193.9	
6. Write UVFITS		198.1		135.0	
7. Write image		2.6		78.0	
8. Form continuum		257.7		98.3	
9. Gain solution	130.0	12.6	84.0	9.81	Load factor 8
10. Image	10200		10560		Load factor 4-8
11. ditto	24371		20710		Load factor 5-14
12. ditto	21434		20300		Load factor 5-12

"**Discussion.** In tests 1-8 ISIS appears to be faster than AIPS in terms of CPU time especially in the imaging step in which the CPU time reported by HORUS was 2.5 times that reported by MAKMAP. This step dominates both the CPU and real time needed for both systems. The large difference in writing FITS files containing the images to tape is due to the use by ISIS of a disk-based FITS format for its internal storage of images.

"Tests 9-12 test the relative performance of the more expensive steps, especially imaging, under various typical daytime loadings. The results were illuminating. These tests demonstrate that there is rough parity in the speeds of the tasks on typically loaded machines. This is due to the fact that the ISIS tasks assume that a large amount of memory is available and when many users are running they start having problems as the paging rate increases. The AIPS tasks are written in such a way that they don't often hit paging troubles. Roughly the real/cpu ratio of an AIPS tasks increases linearly with load factor wheres the same ratio for an ISIS task increases with some power of the load factor. During one of these tests MAKMAP required 60% of the memory whereas HORUS only needed 15% .

"According to Chris Flatters, the time spent in paging on a Convex does not actually appear anywhere in the time statistics associated with a task. So the algorithms we use for real time

consumed should be modified to take the difference between the start and stop times provided by the system.

"The near equality of the timing results of MAKMAP and HORUS under typical loading conditions indicate that there is no performance advantage to using large amounts of virtual memory. The cost of paging in ISIS seems to roughly balance the cost of extra I/O in the AIPS routines. The huge difference in the apparent CPU times seems to be due in part to inadequate accounting in the Convex system."

Documentation

Several documentation publications are currently being revised and will soon be available for distribution. These items may be ordered on the form at the end of this *AIPS*Letter.

The first two of these are the *AIPS COOKBOOK* chapters on calibration of VLA and VLBI data using the *AIPS* calibration package. These describe in some detail the use of the calibration package of tasks and procedures. These should soon be ready for distribution and can be ordered using the form at the back of this issue. Chapter 10 describes processing VLBI data in *AIPS* and chapter 99 describes calibrating VLA data. These chapters will be sent automatically to sites requesting the 15OCT89 release of *AIPS*.

The second document being revised is the programmers' manual "Going *AIPS*". This manual is being rewritten to reflect the many changes made in the *AIPS* software system during the recent overhaul. Outstanding orders for these items will be held until the documents are ready; these items may be ordered using the form at the end of this issue.

Summary of Changes: 15 July 1989 — 15 October 1989

As of this edition of the *AIPS*Letter, we are no longer printing the contents of the software change documentation file, CHANGE.DOC. Anyone wishing to see the details previously given in these files may obtain them as described in the article on AIPSSERV.

Changes of Interest to Users: 15OCT89

As part of the overhaul, there was a change made in the case of messages coming from *AIPS* . Error messages as always are in upper case but informative or warning messages are in mixed case. Also the normal maximum number of interactive *AIPS* has been changed from 6 to 12 (the actual value may be set to less than 12 by the *AIPS* system manager).

After the overhaul, the most widespread changes in *AIPS* were in the general area of calibration of interferometer data. In particular, the adoption of an optional "compressed" uv data format allows a significant reduction (up to a factor of 3) in the amount of disk space and I/O time at the cost of a minor increase in the CPU time used. Not all uv tasks can process the "compressed" format data but those that can't will inform the user. All of the calibration package tasks process compressed data properly as do many of the other critical uv data tasks. New task **UVCMP** will convert between compressed and uncompressed format. Another major improvement for spectral line or snapshot project is the task **HORUS**, which can image

uv data directly from a multisource data file, optionally calibrating and editing, and without requiring the data to be sorted. Multiple channels and/or sources can be processed in a single run of the task.

Task FARAD allows the correction of uv data for the effects of variable ionospheric Faraday rotation. This task can either use a model of the ionosphere based on the mean Sunspot number, or use measurements of the total zenith electron content. These latter measurements, made at Boulder Colorado, are suitable for use with VLA data and will now be distributed by AIPSSERV as described in another article. A set of *AIPS* POPS procedures to simplify the calibration of VLA data are included in a run file named VLAPROCS. These include VLACALIB to run CALIB, VLACLCAL to run CLCAL and VLARESET to reset the calibration tables. Task FILLM which reads VLA archive format tapes was extensively modified. It will now read all data from a given project in a single pass through the tape, automatically expand and contract files as needed, and can append data to the end of a previously existing uv data file. A bug was fixed in the Convex tape handling routines which caused tapes to advance file rather than go to the beginning of the file and to advance file before rewinding. Several serious bugs were fixed in TRANS, PBCOR and the VMS Pseudo AP version of UVMAP.

The ability of *AIPS* to handle frequency and/or bandwidth switching in uv data was strengthened with the introduction of "FQ" tables. These tables, with the optional addition of a new random parameter, allow data with different sets of frequencies to be kept in the same uv data file. A uv data file is still required to have a constant number of spectral channels, polarizations and IFs. The calibration software allows selection by frequency setting or bandwidth using adverbs SELBAN, SELFREQ and FREQID. As currently implemented, the calibration and editing routines will process one set of frequencies/bandwidths at a time. New task SNPLT allows plotting values from the calibration (SN or CL) tables. INDXR will now create a dummy CL table if none previously exists. New task QUACK will flag fixed amounts at the beginning of each scan; this is useful for systems which start recording data prematurely. New task UVHGM provides plots of statistics of a uv data set.

New task MK3IN will read MKIII VLBI correlator "A" tapes. In this release it only works for simple continuum and line data (a single polarization). An accurate description of the geometry used by the correlator is preserved in the CL table as are the measured values of the "phase-cal" signal. The full set of calibration routines have not been tested on this kind of data and are likely to contain errors.

A new adverb, CHANSEL, was introduced into a number of tasks to allow a generalized specification of uv line channels to be averaged into a continuum channel. New task AVSPC uses this to produce a continuum uv data set by averaging selected line channels. BPASS now can average a specified set of channels to form the "channel 0" (continuum) to divide into the line data. New task ISPEC plots spectra from a specified pixel or region of a line cube. New task KNTR will make multiple contour plots on the same page and uses an algorithm suitable for pen plotters. LISTR has a new option to list the source elevations at the times and antenna locations corresponding to entries in an SN or CL table. A bug was fixed in MX which caused it not to process "R" or "L" Stokes' polarization data.

New task FETCH will read and catalog an image from an external text file with a flexible format. This is like CANDY but does not need to be modified, compiled and linkedited. New task TBOUT will write an *AIPS* table into a FITS-like external text file. A task to read these files (TBIN) will be available in the 15JAN90 release. New task SETAN will create an AN table and fill it with information read from an external text file.

Changes of Interest to Users: 15JAN90

A number of new tasks are introduced in this release. RSTOR will convolve CLEAN components with a Gaussian and add them to an image. SOLCL will apply system temperature measurements for solar observations made with the VLA. UVMTH will time average one uv data file and will add, subtract, multiply or divide the averaged values to/from/by/into the visibility data in another uv data file. BLFIT will solve for source and/or antenna positions from residual phases in an SN or CL table. TBIN can read external FITS-like

tables of the form written by TBOUT and convert them into *AIPS* tables. ACFIT will determine the amplitude of antenna gains for spectral line uv data by fitting a "template" spectrum to the observed autocorrelation spectra. A new adverb, FQTOL, was added to DBCON to allow user control of the definition of FQ ids.

BPASS can now divide line uv data by continuum data from another file. The polarization calibration task PCAL will now apply ionospheric Faraday rotation corrections before determining the instrumental and source polarizations. Corrections for ionospheric Faraday rotation are now applied in any routine that applied the polarization correction. MK3IN can now read data from polarization experiments done with the MkIII VLBI system. LISTR now can have a fixed scaling for amplitude listing, separate scaling for amplitude and RMS values and a Dec-10 like gain listing option. SNPLT can now plot doppler offsets from a CL table. UVFIX can now process compressed format uv data and a correction has been made in it's computation of the correct orientation of the field at the standard epoch. UVCOP can now select either auto- or cross-correlation data to copy. A bug was fixed in VLBIN in the lobe rotation of station "B" data in MkII VLBI spectral line data. Numerous bugs were fixed in CVEL which corrects spectroscopic interferometer data for the earth's rotation. A bug was fixed in verb GET which caused minimum match to fail if there were more than 10 potential matches. A bug in the gridded subtraction method used by MX and UVSUB which introduced horizontal stripes into images was fixed.

The *AIPS* table access routines have been modified to recatalog "forgotten" *AIPS* tables; reading a "forgotten" table with PRTAB or other task will cause it to be recataloged. The Unix file destruction routines have been streamlined to speed up the destruction of files.

Changes of Interest to Programmers: 15OCT89

As the first release of the overhauled version of *AIPS* there are many more changes of interest to programmers than can be given here. The programmers' manual "Going *AIPS*" is being revised, and interested programmers should order a copy. In addition, a more detailed description of the changes is now included with *AIPS* installation tapes. Among the many changes are the way INCLUDEs are processed. There is now a source preprocessor on all systems to include text files; among other things. This preprocessor allows defining a "Local INCLUDE" in the file in which it is to be included.

Another major change is the way in which characters are handled inside *AIPS*. Most usages are now declared CHARACTER in Fortran; in the few cases where the definition of Fortran disallows use of CHARACTER variables (in any form of equivalencing) *AIPS* uses type HOLLERITH (4 characters per numeric element). Since only ANSI Fortran 77 types are allowed, literals are now allowed in call sequences. Another major improvement is the ability to store Keyword/Value pairs in the catalog header file using routine CATKEY.

The introduction of "Compressed" uv data into *AIPS* has an impact on many tasks which process uv data. Tasks that use UVGET to read uv data are unaffected, as this routine always returns data in the expanded form. In the compressed format, the correlation coefficients are each packed into a single real word in a machine dependent manner. On current implementations this packing is into a pair of scaled 2 byte integers with magic value blanking. Compressed data thus can have only a single weight per visibility but individual values may be flagged bad. New subroutines ZUVPAK and ZUVXND are used to compress and uncompress data. Two new random parameters "WEIGHT" and "SCALE" are introduced for compressed data.

Programmers interested in the calibration area should study the wide-reaching changes brought about with the FQ tables . All calibration tasks require three new adverbs, SELBAND, SELFREQ, and FREQID. Several basic subroutines have had their call sequences changed; these include CHNDAT, FRQTAB, CHNCOP, TABCAL, TABSN, TABBL, TABBP, and TABNDX. Several table files have had an extra column added, namely the CL, SN, BL, BP and MX tables. Other useful tools in the uv-calibration area are SETSTK, to translate the user's STOKES value, REQBAS, to translate the user's ANTENNAS and BASELINE adverb values, and WANTCH and AVGCHN, to

handle the new CHANSEL adverb. The polarization calibration routines have been modified to process data from orthogonal linearly polarized feeds although this is still largely untested.

Documentation of the new formats of a number of the *AIPS* system files are now available. The descriptions of the AC, BA, BQ, CA, CB, HI, IC, MS, SG, TC, TD, and TS files are in DOCTXT:MV2C06xx. where xx is the 2 character file type. This documentation will probably be incorporated into Going *AIPS*.

Several useful utility routines have been introduced which are related to the introduction of FQ tables. FQMATC checks user specified frequency/bandpass specification against the FQ table to determine the desired FQID. Routine SELINI is useful for initializing the selection and control parameters passed to UVGET in include DSEL.INC. If tables need to be reformatted due to the additions of columns, then BLREFM, BPREFM, CLREFM and SNREFM will reformat BL, BP, CL, and SN tables. The number of columns in each type of table used in the calibration system is now defined in the PARAMETER include PUVD.INC.

The format of help files has also changed. They begin with a precursor section which gives a one-line description and keyword values as well as separator lines. Any line beginning with a semi-colon is now treated as a comment line in help files and is ignored. The maximum number of interactive *AIPS* allowed is now 15 if there is no batch and 14 minus the number of batch queues if there is batch. The system manager can set the limit lower than this. All service programs now have free-format inputs. This makes a serious change in the format of the main input line to POPSGN, for example. Gripes may be sent to Charlottesville on tape using GRITP or turned into text form for e-mail using GR2TEX. Both of these were cleaned up and improved over the quarter.

The Z-routine areas of the code were simplified by dropping obsolete operating systems and distinctions. The Unix area is now divided into a Bell area, with Masscomp and Cray sub-areas, and a Berkeley area, with Alliant, Convex, Sun, and Vax sub-areas. The midnight job was generalized to have separate "lastgood" dates for the separate portions of the job. The VMS system translation of logicals was extended and the printing of a NOTICE.TXT file was added to the AIPS procedure. The TV is now a logical rather than a symbol for VMS.

Changes of Interest to Programmers: 15JAN90

A package or J2000 precession routines is now available; JPRECS is the highest level routine. New routines HIMERG and HIADDN simplify the concatenating of history files; two copies of the same file will not be written to the output file. Utility routine GETFQ will get the information for a given FQID from the FQ table. The axis labels for plots are now allowed to be 20 characters rather than 8. New routine PUTCOL stores a given value into an *AIPS* table entry. Parsing routine GETNUM now returns a value of DBLANK when it attempts to read a bad value. A number of improvements were made to the DDT tests.

AIPS USER AGREEMENT

ASSOCIATED UNIVERSITIES, INC.

NATIONAL RADIO ASTRONOMY OBSERVATORY

THIS AGREEMENT, made this ____ day of _____, 19____, between ASSOCIATED UNIVERSITIES, INC./NATIONAL RADIO ASTRONOMY OBSERVATORY, Charlottesville, Virginia, hereinafter called the Developer; and _____ hereinafter called the User.

WHEREAS, the Developer has developed an Astronomical Image Processing System (AIPS) under agreement with the National Science Foundation; and

WHEREAS, the Developer desires to promote basic research, particularly in astronomy, throughout the world; and

WHEREAS, the Developer has determined that distribution of AIPS to User will further such research.

Now, Therefore, in consideration of the mutual covenants and agreements herein contained, the parties agree as follows:

1. For no charge, Developer hereby grants to the User a non-exclusive right to use the Astronomical Image Processing System (AIPS).
2. User acknowledges that the AIPS software/system, including all documentation, will be used primarily by User for basic research.
3. The Developer agrees that it will make available to User updates and modifications to AIPS; however, Developer is under no obligation to do so.
4. The AIPS software/documentation shall not be transfered, sold, or assigned to a third party.
5. AIPS shall not be copied or duplicated except as follows:
   a. AIPS may be copied for backup purposes.
   b. AIPS may be duplicated and run on all systems supported by the User's AIPS Manager, who will be the designated operational contact person between the User and Developer, provided that its use on all such systems is in accordance with the dictates of this agreement.
6. The obligation to use, install, and run AIPS shall be the sole responsibility of the User. It is understood that the Developer makes no warranties, claims, or other assertions, implied or otherwise, concerning the performance or integrity of AIPS or the suitability of AIPS for a particular purpose.
7 User acknowledges that any data, tapes, or containers received from the Developer are and shall remain Developer's property and shall be returned upon request of the Developer, when updated materials are requested by User or at termination of this agreement.
8. This Agreement shall remain in effect for a period of five (5) years from the data hereof.

ASSOCIATED UNIVERSITIES, INC.

Company	**Signature**
Signature	**Title**
Title	

Please indicate technical contact person (i.e. AIPS Manager):

AIPS Order Form

1. Name and address of Contact Person: _____

   ☐ Address label on back is correct _____

   include street address for UPS delivery _____

   _____

2. ☐ new order ☐ reorder (*N.B.*: If you have received a plastic mailing container from us, we insist that you use it for a reorder. Also return tape(s).)

   Version of *AIPS* currently running: _____

3. *AIPS* version desired: . . . . . ☐ 15-Apr-1989 (pre-overhaul)
   ☐ 15-Oct-1989 (post-overhaul)
   (Shipped ≈ 1 week after release date) ☐ 15-Jan-1990

4. Tape type desired:
   (*AIPS*, VMS only) . . . . . ☐ Vax/VMS BACKUP
   (*AIPS*, Unix only) . . . . . ☐ Unix tar
   Version of Unix system in use: _____
   N.B. we need to know this. *e.g.*, bsd4.*x*, Sys III, Sys V, V7, *etc.*
   (*AIPS*, neither Unix nor VMS) . . . . . ☐ FITS compressed text format
   (DDT test package: ≥ 15APR89) . . . . . ☐ FITS binary data ("large" on 6250 bpi only)

5. Tape density desired: . . . . . ☐ 1600 bpi ☐ 6250 bpi ☐ QIC 24 (tar only)

6. There are gripes on (returned) tape: . . . ☐ Yes ☐ No

7. Printed documents requested: . . . . . ☐ Full 15OCT86 *COOKBOOK* (no binder)
   ☐ revised *COOKBOOK* chapters: _____
   ☐ 15APR90 *GOING AIPS* Vol 1 (no binder)
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